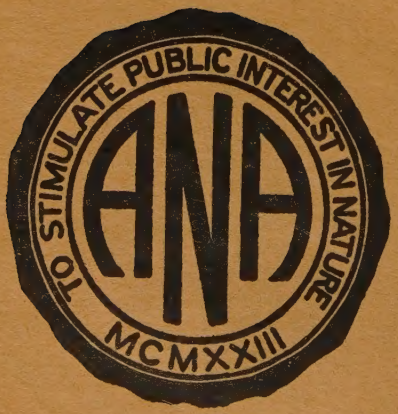
# NATURE MAGAZINE

tober, 1945 35 Cents Vol. 38, No. 8

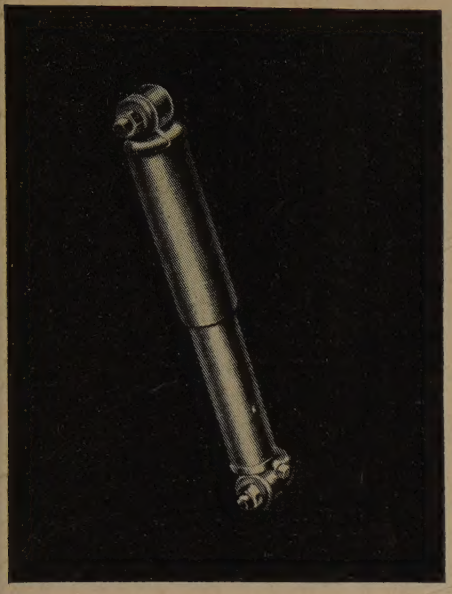
# This badge of service

*will be worn by 13,000,000 men and women who have honorably served their country.*




THOSE who wear this button have been honorably discharged from the armed forces of the United States. They have sacrificed months out of their lives to protect their country and its people; to defend those things that we all hold dear—home, family and freedom.

The emblem these men and women wear represents their devotion to their country. It stands for a task well and faithfully done. The American Nature Association joins all Americans in paying tribute to those who wear these golden eagles; in welcoming them back to the civilian life they left when their country needed them.



# How many of these do you own?

**If you look** under your car, you'll probably find a couple of gadgets something like this one.

They're shock absorbers.

They take the sting out of sudden bumps and jolts. They make a rough road smoother.

**And if you're wise,** somewhere in your desk, or bureau drawer, or safe deposit box, you have a lot *more* shock absorbers. Paper ones. War Bonds.

If, in the days to come, bad luck strikes at you through illness, accident, or loss of job, your War Bonds can soften the blow.

If there are some financial rough spots in the road ahead, your War Bonds can help smooth them out for you.

**Buy all the War Bonds** you can. Hang on to them. Because it's such good sense, and because there's a bitter, bloody, deadly war still on.

**BUY ALL THE BONDS YOU CAN KEEP ALL THE BONDS YOU BUY**

**AMERICAN NATURE ASSOCIATION**

*This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council*


## TO A WOOD DUCK

By CHARLES E. GILHAM

The wood duck drake arched his beautiful crest and gulped another pecan. Chill frost was in the air. Another day possibly, and he would be winging his way to southern delta timberlands, away from his beloved Illinois River island.

Long shadows cast their eerie shapes through the pecan trees before a crimson flood in the western sky. Suddenly the drake cast a look of apprehension toward his gray demure spouse. Possibly it was a sixth sense that warned him, if ducks have such things—but it came too late.

A flash, and the boom of a poacher's gun broke the stillness of the overflow lands. The little hen bird lay beating her wings in the shallows. Although wounded unto death, the tiny drake sprang into the air. His stout heart guided his erratic flight through the lengthening shadows. Two hundred yards he flew, then fell in a heap on a little wooded knoll. Self-preservation still uppermost, the stricken bird dragged his failing body to a nearby hollow log, and without hesitation crawled into it—as far as he could go. There he died, in the heart of a mouldering tree. The pecans, tight-packed in his crop, for the time being died with him.

Thirty years later, a little girl gathered pecans on a tiny wooded knoll. "Oh, Daddy," she cried. "Isn't the grove beautiful? Is it true that only God can make a tree? Who planted the pecans, Daddy?"

"Yes, God makes trees, Lucy. And squirrels plant the nuts, so that other squirrels can have pecans to eat. Isn't that a nice way for things to be?"

And God looked down and smiled. The man did not know that wood ducks like pecans too.

---

## Lead Poison Solution

Students of ducks have proved that many die from lead poisoning because the birds take up, with gravel, accumulations of lead shot that have built up on lake bottoms around heavily-hunted areas. Now comes the Dow Chemical Company with the proposal that shot be made from lead alloyed with a small percentage of magnesium, which causes the pellet to disintegrate in water. This alloy is said to be harder than chilled shot, and the additional cost of manufacture is insignificant.

---

## Animal World Day

Friends of animals, wild and domestic, are asked by the World League against Vivisection and for Protection of Animals to dedicate October 4 as "World Day for Animals." This date is selected because it is one pre-eminently associated with St. Francis of Assisi.

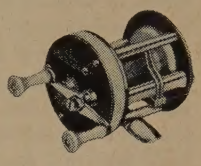
*For the Bait Casting Angler*

**We're Making Plans To Make This Tackle FIRST!**

First for the bait casting angler—when we start to make tackle again—will be these pre-war "old dependables." Pre-war! Brings back a vision of *quality.* And that's exactly what we plan: a *complete* line for every type of fishing, *quality* through and through.

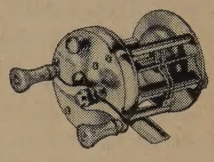
**PERFECTORENO Reels**
**No Thumbing—No Backlash**

As soon as reels are again in production, these two Perfectorenos will be made first: the beautiful No. 760 in maroon anodized aluminum and smoky pearl, and No. 775 in nickel silver.



**ANTI-BACK-LASH Reels**
**"Where Performance Counts"**

The reels that put more fun in fishing! Two favorite, popular priced models, Nos. 450 and 1000, will go into production first. See your dealer!



**FAMOUS SOUTH BEND RODS**
**Solid and Tubular Steel—Split Bamboo**

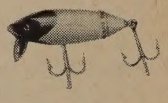
Some of our post-war rods will be built of genuine Tonkin Cane, seasoned in our vaults since pre-war days; some will be built of finest steel, solid and tubular. Whatever your choice, the South Bend name assures *dependability.*

**BLACK-ORENO**
**"The Line You Can Trust"**

Made of highest quality silk—hard-braided, waterproofed, extra smooth finish—greater tensile strength, casting ease!

**FISH-OBITE**
**"The Bait That's Right"**

All the popular patterns will again be made in this and other famous baits—the Bass-Oreno, Dive-Oreno, Pike-Oreno, Surf-Oreno.



**Fishing Photo Book *FREE!***

This beautifully printed 48-page book shows all 36 prize winners in our 1944 Fishing Photo Contest—plus full-color pages of the Quality Tackle we plan to make first. Send for a copy.

**SOUTH BEND BAIT COMPANY**
**938-11 High Street, South Bend 23, Indiana**

**SOUTH BEND**

*A Name Famous in Fishing*

**BUY AND KEEP MORE WAR BONDS**

# Nature in Print

*By* HOWARD ZAHNISER

As these words are being written there seems to be a very strong and joyful probability that they will be read in that postwar world of which there has been so much dreaming and talking. How different the world seems on this twelfth day of August, 1945, than on that Pearl Harbor Sabbath nearly four years ago when the swift onset of war made such writing (or reading) a psychological impossibility. For we have not only subdued the enemies that once so successfully threatened us, but we have also astoundingly extended our mastery over the mysterious forces of the universe. And we are sober, profoundly sober. For we stand in awe not of our enemies, nor of universal forces, but of ourselves. We who have learned how to shatter an atom stand in open-mouthed wonder at what we have done, and may do, with the energy we have learned how to release. Remembering the ancient observation that "the fear of the Lord is the beginning of wisdom," we can hope that this new human awe at human possibilities may indeed be a beginning of wisdom. As we constantly become more and more nearly lords of creation, there is nothing so much to be feared as ourselves, yet we know so little about fearsome us. In this brave new postwar world—and it must be brave—surely as never before the proper study of mankind is man.

On that shattering day when first we all knew that we were living with fellow men who had atomic energy at their command, a woman with broad knowledge of the plant sciences expressed in my hearing the opinion that the age of the biologist had suddenly become the age of the physicist. However valid the prediction may prove to be, however exact it may be to describe the past century as one of dominance for the biologist, the thought of a future diversion of students of life into further explorations of matter and energy is indeed an awful thought. Our resource of biological scientists—damaged as all our resources of scientists have been by war—is already seriously depleted, and we can ill afford in this dispensation to divert the efforts of our oncoming biological scientists to further the already fearfully advanced physical sciences. "That scientist to whom is revealed most clearly the nature of man and beast," writes Mrs. G. Kingsley Noble, "will not be a narrow specialist but a worker who, like the plainsman, has his feet firmly on the ground yet is aware of the far horizons all around him." So far have the biological scientists advanced in their specialties that we can fervently trust that they and their successors will persist in their quest for an understanding of life and what we consider its greatest manifestation—the human being that seems to have it in his power to release violently the orderly employed energy of the universe.

We shall all do well to follow as closely the findings and interpretations of our biologists as we do the achievements of our atom smashers, for we shall need as never before, in an humble appraisal of our responsibilities, a meditative search for knowledge of how we can conduct ourselves. Ruth Crosby Noble's "popular account of animal psychology from the point of view of a naturalist," entitled *The Nature of the Beast*, is a timely introduction; a timely compendium of much that has already been discovered. Mrs. Noble's book is based largely on the scientific publications, lectures, and notes of her late husband, Dr. G. Kingsley Noble, of the American Museum of Natural History. "His the sturdy roots and trunk of this tree," she says in a tender dedication, "mine but the branches." And the reader can honor both the memory of Dr. Noble, who had acquired such a wealth of information, and the devotion of Mrs. Noble, who has seen that the tree of this knowledge has branched out into its printed leaves. Mrs. Noble is explicit in pointing out that "the animal mind is not simply an immature or primitive human mind; the world which an animal senses is an entirely different world from our own." A reading and study of *The Nature of the Beast* proves, however, the reality of her introductory promise: "In delving into the nature of the beast we shall indeed find much that illumines human nature." And such an illumination is a gleam that we shall do well to follow.

Mrs. Noble quotes the twenty-year-old Ralph Waldo Emerson's journal notation, "Man is an animal that looks before and after." Gunda, an Indian elephant at the New York Zoological Park, she tells in an anecdote typical of the hundreds included in this fascinating book, "proved particularly apt in handling currency. . . . On one occasion, hearing him ring up four pennies in quick succession, the keeper detected the elephant withdrawing a secret deposit, placed as if for safekeeping on the flat top of the wall of his enclosure." Ringing up pennies for the sake of forthcoming biscuits or peanuts, and saving up pennies for future "purchases" seem to come about as close as any sub-human animal comes to showing foresight. There is an echo, in Emerson's comment, of Shelley's poetic lines in "To A Skylark," but there is added a reasoning implication that foresight and retrospect are the distinguishing powers of man. One can hope that these powers are deliberately used. And one can expect that the backward look through man's many stages of development, which one can get through Mrs. Noble's exploration of all stages of animal life today, will make possible a more "intelligent" use of the power of foresight.

Mrs. Noble's explorations in the accumulated treasury of the biologist's knowledge reveal many limitations of man's capacities.

"So we see," she writes, "that man has a priceless treasure in his highly developed thinking cap. It is his unique possession, the only thing which clearly distinguishes him from his animal companions. Yet despite this effective cortex, with its layer upon layer of gray-matter padding, man can never quite suppress his old fish brain, the chief center of his emotions and instincts. Though deeply buried, it is still there, structurally and functionally, and at times it seizes control of the body. We all know the saying, and perhaps the feeling, 'It's the animal in us.' We cannot break entirely from our primitive reactions. Beneath the superstructure of reason, experience, imagination, and judgment we have the same animal drives which motivate the fish, the reptile, the lower mammals."

And now this lord of all creatures, with the old unsuppressed fish brain, knows how to drop from the air a small accumulation of matter containing exploding atoms that can pulverize a city, and blow its structures and inhabitants into a cloud of dust rising forty thousand feet toward the space in which his small planet rotates and revolves. In a very homely and familiar phrase it is indeed about time that he should begin to "know his own mind."

## Boy Reading Braille

*By* ROSE MYRA PHILLIPS

Though sightless, he beholds far hillsides bright
Against the pitchy darkness of his night;
And yielding to their beckonings, he goes
Up, up a sunlit slope. He sees the rose
Gleaming with crimson fire, and every tree
Aglow with glistening leaves. The fulgency
Of wind-swept grass is laughter; golden birds
Wing in and out among the radiant words.
This Bartimeus fingers many a star,
Yet knows how intimate the shadows are!

Mrs. Noble can help him, for she can reveal to him many of the objective findings about the "mind" of the creatures of which he is both lord and offspring. "Higher Intelligence," "Emotions," "Societies," "Social Rank," "Staking Out Territory," "Sex Recognition," "Courtship," "Parenthood," "Hormones and Behavior," "Abnormal Behavior"—these are some of her seventeen chapter titles, and they are warning signs, as well as labels for some of the most interesting facts, incidents, and interpretations that a man can read.

We must certainly honor the naturalists, the experimental biologists, and all the specialists who can derive for us from Nature these aids to our understanding of ourselves, nor overlook the services of a Mrs. Noble who makes so many of them available to us laymen. We can hope with Mrs. Noble for "the distant future when a few great laws will be found to explain all nature," and we can hope too that man can live in a humble "fear of the Lord" wisely enough to reach that distant future. "Philosophers and scientists with a depth of knowledge and breadth of vision," Mrs. Noble reports, "unite in a common conviction that all life and all matter are parts of one great whole." All of us can unite in a determination to do our best to understand the cosmos we now perceive before we shatter its whole into disintegrating atoms.

*The Nature of the Beast: A Popular Account of Animal Psychology from the Point of View of a Naturalist.* By Ruth Crosby Noble. New York: Doubleday, Doran and Company, Inc. 1945. 244 pp., with 24 photographs on 8 plates, bibliography of 99 other works, and index, $2.75.

## Guide to Mosses

*How to Know the Mosses.* By Henry S. Conard. Dubuque, Iowa. 1945. Wm. C. Brown Co. 166 pages. Illustrated. Cloth binding. $2.50; spiral binding, $1.50.

This is one of the books in the excellent "Picture-key Nature Series", and it provides a guide for determining the identity of many of the North American mosses and liverworts. The book includes suggestions and aids for their study. The author is professor of botany at Grinnell College and president of the Sullivant Moss Society. Like others in the series it is a practical and usable guide, presupposing a certain fundamental knowledge of botany and its terms.

## Hawaiian Insects

*Common Insects of Hawaii.* By David T. Fullaway and Noel L. H. Krauss. Honolulu, Hawaii (5). 1945. Tongg Publishing Company. 228 pages. Illustrated in color and black and white. $3.50.

The authors of this book, which may now be added to the growing list of volumes available to those interested in the natural history of the Pacific area, are entomologists with the Board of Agriculture and Forestry of the Territory of Hawaii. This is an identification text with the descriptions helpfully supplemented by twelve full-page color plates, adequately, if not superlatively, reproduced. The authors claim for their book only that it provides a cross section of the lowland insect fauna of the islands.

## Louis Agassiz

*Louis Agassiz as a Teacher.* Ithaca, New York. 1945. Comstock Publishing Company. 90 pages. Frontispiece picture of Agassiz. Revised and amplified 2nd edition. $1.50.

This little book is a collection of illustrative extracts on the method of instruction employed by the great naturalist and teacher, whose precept was to teach men to observe. This material has been gathered together by Lane Cooper, Professor Emeritus of the English Language and Literature in Cornell University, who supplies a preface and introductory note. This is a little book that every teacher, not only of Nature and Science, but any subject, would do well to read.

## Game Cuisine

*Cooking Wild Game.* By Frank G. Ashbrook and Edna N. Sater. Foreword by Jay N. Darling. New York, 1945. Orange Judd Publishing Company. 358 pages. Illustrated. $4.00.

This is the *Fannie Farmer* of the sportsman, prepared by two members of the staff of the United States Fish and Wildlife Service. "Ding" Darling, in a foreword, describes the book as "another praiseworthy attempt to reduce the ratio of gastronomic illiteracy of a world filled with people whose No. 1 Project since the dawn of their first hairy ancestors has been the search for something good to eat. . . . There is an old tradition that good cooks are all just a little mad but if so it is certainly one of the pleasantest forms of insanity and altogether beneficial to society. It should be encouraged and this book should be a big step in the right direction."

## Without Benefits of Mother

Clay Lilly of Raeford, North Carolina, was operating a road grader on a highway shoulder when the blade killed a mother quail. Investigation showed that the grader was set to clear the nest and the thirteen eggs were unharmed. Hoping that a setting bantam hen at home would take over incubation, Mr. Lilly gathered the eggs into a toesack. When he got home eleven chicks had already hatched, and the other two were entrusted to the hen. Our report does not provide information, however, as to whether thirteen was a lucky number in this case.

**Young Mother Delighted With Writing Success**

"After taking the N.I.A. course, the first article submitted to a top-flight woman's magazine, resulted in its prompt acceptance. Despite my domestic duties, including the rearing of a small daughter, I have found time to write a dozen stories, all of which have been accepted. All potential writers should sign up with N.I.A." —Marcia Audrey Garden, 2302 West Main St, Richmond 20, Va.

# Why Can't You Write?

## *It's much simpler than you think!*

SO many people with the "germ" of writing in them simply can't get started. They suffer from inertia. Or they set up imaginary barriers to taking the first step.

Many are convinced the field is confined to persons gifted with a genius for writing.

Few realize that the great bulk of commercial writing is done by so-called "unknowns."

Not only do these thousands of men and women produce most of the fiction published, but countless articles on social matters, nature studies, business affairs, homemaking, travel, sports, local and club activities, etc., as well.

Such material is in constant demand. Every week thousands of checks for $25, $50 and $100 go out to writers whose latent ability was perhaps no greater than yours.

### *The Practical Method*

Newspaper work demonstrates that the way to learn to write is by writing! Newspaper copy desk editors waste no time on theories or ancient classics. The *story* is the thing. Every copy "cub" goes through the course of practical criticism—a training that turns out more successful authors than any other experience.

That is why Newspaper Institute of America bases its writing instruction on the Copy Desk Method. It starts and keeps you writing in your own home, on your own time. And upon the very same kind of *actual assignments* given daily to metropolitan reporters. Thus you learn by *doing*, not by studying the individual styles of model authors.

Each week your work is analyzed constructively by practical writers. Gradually they help to clarify your own *distinctive* style. Writing soon becomes easy, absorbing. Profitable, too, as you gain the "professional" touch that gets your material accepted by editors. Above all, you can see constant progress week by week as your faults are corrected and your writing ability grows.

### *Have You Natural Ability?*

Our Writing Aptitude Test will reveal whether or not you have natural talent for writing. It will analyze your powers of observation, your imagination and dramatic instinct. You'll enjoy taking this test. There is no cost or obligation. Simply mail the coupon below, today, Newspaper Institute of America, One Park Avenue, New York 16, N. Y. (Founded 1925).

**NOTICE TO CANADIANS**

**Newspaper Institute's operations in Canada have been approved by the Foreign Exchange Control Board, and to facilitate all financial transactions, a special permit has been assigned to their account with The Canadan Bank of Commerce, Montreal.**

Free

Newspaper Institute of America,
One Park Ave., New York 16, N. Y.

Send me, without cost or obligation, your *Writing Aptitude Test* and further information about writing for profit as promised in NATURE MAGAZINE, October.

Mr. / Mrs. / Miss } .....

Address .....

(All correspondence confidential. No salesman will call on you) 87-S-595

COPYRIGHT 1945, NEWSPAPER INSTITUTE OF AMERICA

# NATURE MAGAZINE

PUBLISHED BY THE AMERICAN NATURE ASSOCIATION

To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great National Resources of America

## IN THIS ISSUE

October, 1945 Vol. 38, No. 10

Monarch Butterflies .....Hexom Cover
Nature in Print .....Howard Zahniser 394
Boy Reading Braille (Poem) Rose Myra Phillips 394
Contents Noted .....R. W. W. 399
October (Poem) .....Allen E. Woodall 400
Fulfillment ..... John Lindsey Blackford 401
A Natural Water-Garden Alexander F. Skutch 404
Plant Diseases that Have Made History E. E. Stanford 405
Honker, Leader of the Flock W. J. Schoonmaker 409
Measuring Midway for a New Green Gown E. D. Neff 412
A Talking Starling .....H. R. Ivor 415
The Neighbor's Pet Crow Comes to Tea (Poem) .....Marion Doyle 416
Household Enemies on the Home Front E. Laurence Palmer 417-424
As We See It (Editorial)..... 425
Blackwater.....Allan and Ellen Bonwill 426
Born and Bred on Bananas Alexander F. Skutch 429
Start with Joe-pye Weed Edwin F. Steffek 430
"Raccy", the Mascot of Rattlesnake Shack A. B. Champlain 431
Wheel Chair Naturalist Afield and at Work Charlotte Hilton Green 433
Portrait of Indian Summer (Poem) Cosette Middleton 435
Our Ancient Earth.....Isabel M. Lewis 436
Celestial Change (Poem)..Oren Root Brown 437
The School Page .....E. Laurence Palmer 438
To a Teacher (Poem)..Elinor Henry Brown 438
Under the Microscope..Julian D. Corrington 446

**A. B. McClanahan, Advertising Manager**

ADVERTISING OFFICES

New York 17—295 Madison Avenue Los Angeles 15—Western Pacific Bldg.
Washington 6—1214 16th St., N.W. San Francisco 4—Mills Building
Chicago—203 N. Wabash Avenue Minneapolis 2—233 Radisson Hotel

NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D. C., U. S. A., and accepted for mailing purposes at the special flat rate of postage provided for in the United States Postal Act of October 3rd, 1917, and February 28th, 1925.

Publication and Editorial Office, 1214 16th Street, N.W., Washington 6, D. C.

Copyright, 1945 by American Nature Association. Title Registered U. S. Patent Office. Printed in the United States.

### THE ASSOCIATION

ARTHUR NEWTON PACK.....President
Abiquiu, N. M.

RANDOLPH G. PACK.....Vice-President
Darien, Conn.

RICHARD W. WESTWOOD.....Secretary
Washington, D. C.

JAMES A. O'HEARN.....Treasurer
South Orange, N. J.

HARRY E. RADCLIFFE.....Business Manager
Washington, D. C.

DR. E. LAURENCE PALMER.....Director, Nature Education
Cornell University, New York

### THE MAGAZINE

RICHARD W. WESTWOOD.....Editor
EDWARD A. PREBLE.....Associate Editor
JULIAN D. CORRINGTON.....Microscopy Editor
ISABEL M. LEWIS.....Astronomy Editor
E. LAURENCE PALMER.....School Editor
ANDREW S. WING.....Garden Editor
HOWARD ZAHNISER.....Book Editor
R. BRUCE HORSFALL.....Artist
HARRY E. RADCLIFFE.....Business Manager

### SCIENTIFIC CONSULTING BOARD

DR. LELAND O. HOWARD
Retired Chief, U. S. Bureau of Entomology

DR. WALDO L. SCHMITT
Curator of Marine Invertebrates, U. S. National Museum

DR. HARRY C. OBERHOLSER
Cleveland Museum of Natural History

W. L. McATEE
Technical Adviser, U. S. Fish and Wildlife Service

C. W. GILMORE
Curator of Vertebrate Paleontology, U. S. National Museum

DR. PAUL BARTSCH
Curator of Mollusks, U. S. National Museum

DR. EDGAR T. WHERRY
Wild Flower Preservation Society

DR. WILLIAM M. MANN
Director, National Zoological Park

# A Better, Longer Life . . . *Through Optical Science*

Today, science, using the methods made possible by optical instruments, helps you live a longer, healthier and happier life. Today, your baby, if he is between one and two years of age, can expect to enjoy more than sixty years of life. In 1900, his life expectancy would have been but forty-eight years.

Of the many specialized branches of science which contribute so much to your life, bacteriology is among the most important. It is the basis of modern medicine and the controlling science in the production of pure foods. Its development was made possible only through the use of the microscope . . . furthered by such far reaching developments as the quantity production of these instruments by Bausch & Lomb.

In the creation, through chemistry, of modern lifesaving drugs, optical instruments of research and control are of vital importance.

Better vision, too, which makes life more enjoyable and safer for millions, is the result of the application of optical science to problems of eyesight correction and conservation.

Great as have been the achievements to which optical science has contributed, greater things are yet to come, developments which will be paced by new and better optical instruments from America's leading optical institution . . . Bausch & Lomb Optical Co., Rochester 2, N. Y.

BAUSCH & LOMB

ESTABLISHED 1853

*Makers of Optical Glass and a Complete Line of Optical Instruments for Military Use, Education, Research, Industry, and Eyesight Correction and Conservation*

# *IT HELPED SINK SIX JAPANESE WARSHIPS*

A little over a year ago we told you how a secret device had helped win a great battle. The device came back from the wars, was sealed in a box, and placed in the vaults at Bell Telephone Laboratories.

We couldn't tell you the full story then for security reasons, but now we can open the box and let you know what was inside. It was a magnetron, a kind of electronic tube, installed and operated in Radar equipment on the famous *U. S. S. Boise*.

The Radar was used in night action off Savo Island in the Solomon Island group on October 11-12, 1942. During the engagement, six Japanese warships were sent to the bottom.

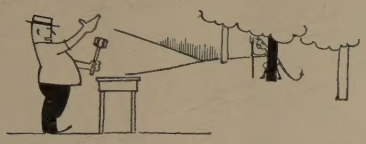
Long before Pearl Harbor the Government asked Bell Telephone Laboratories to put its wide experience and knowledge of electronics to work in perfecting Radar as a military instrument. Through Western Electric Company, its manufacturing branch, **the Bell System became the largest source of Radar for our fighting forces.**

This is not surprising for Radar development and production stem from the same roots that produced and continue to nourish this country's telephone system.

**BELL TELEPHONE SYSTEM**

# Contents Noted

HAVING found a customer for Purgatory, the State of North Carolina is open to offers for Hell. It will surprise many to realize that North Carolina owned both places, but it seems it does—or did. Both Purgatory and Hell are what are known as pocosins, tracts of semi-bogs that get very wet or very dry, have extremely acid soils, support a cover of evergreen shrubs and scrubby pines. These areas do not look like much—in fact, they look like Hell, and North Carolina is still stuck with the latter. Before a buyer for Purgatory was found, it, and Hell, were properties of the State Board of Education, which, with becoming dignity, is open for bids for its remaining profane holdings.



INCREASE of sixty-eight percent in the acreage planted to popcorn in 1945 is reported by the U. S. Department of Agriculture. Delving for reasons, the agricultural specialists say that shortage of sugar made many families pop corn last winter as a candy substitute; shortage of gasoline kept families home in the evening and made popcorn more popular; new varieties yielding a greater volume of popped corn brought popcorn into new favor. Anyway, we regard it as a good sign, a trend back toward those simpler pleasures of an earlier day. Too few, today, learn the pleasure of holding the long handle of the popper and hearing the restless kernels exploding into white puffs like tiny soft thunderheads. The memory is so nostalgic we could, at the moment, even appreciate a wood-burnt tie rack or a cigarband ash tray.

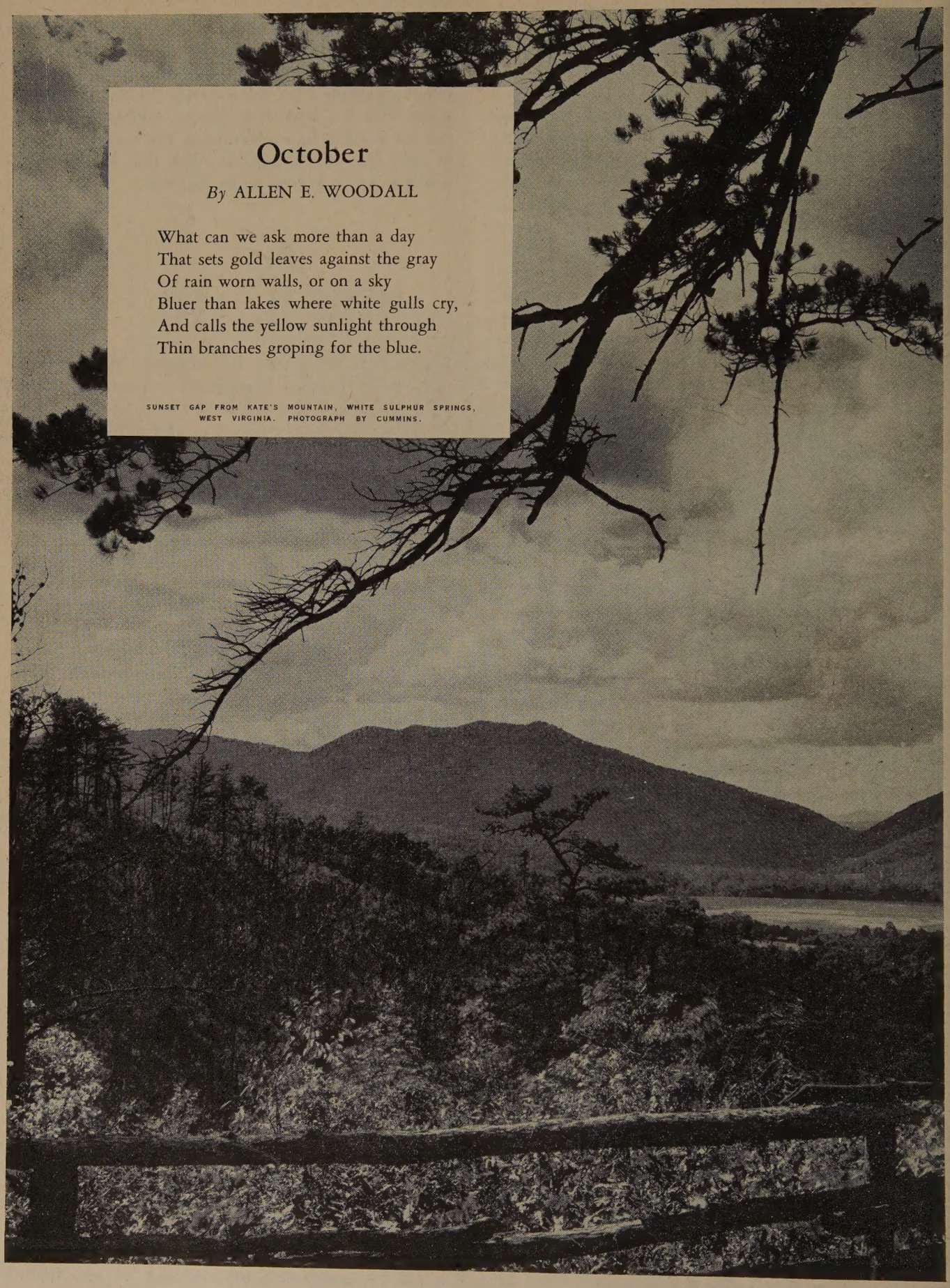
NOW that we have Guam securely back in our hands we are certainly making it over in more ways than one. According to the California State Division of Fish and Game, Admiral Nimitz discovered that there were no upland game birds on the island. He suggested that some ring-necked pheasants might be happy there. So sixty birds were crated at the California State game farm. They rode in a C-47, stopping off in Hawaii for watering and were airborne for thirty-one hours at altitudes up to 8500 feet. Fifty-five made the trip and were liberated in two groups of 24 and 31 birds respectively. The Admiral personally supervised the liberation of one group, Major-General Larson, Marine commander on Guam, sponsored the other group. No bets are being made that the birds will survive soldier, sailor and marine marksmen, natives, rats, and such stray Japs as may be still hiding out, but the Admiral and General are reported to be hopeful.

RECENTLY a young Swarthmore, Pennsylvania, chemist made some of the insecticide, DDT, bottled it, and it was offered for sale by a local druggist. The WPB stepped in and confiscated what was left because DDT was still restricted for war purposes. In the newspapers and over the air there was some indignation about this on the part of thoughtless editors and radio commentators. They failed to realize that exhaustive experiments are being conducted to discover how lethal DDT is to beneficial insects, birds, mammals, fishes, amphibians and other forms of life important to human existence. The insecticide is known to kill fishes and amphibians; it also kills bees and other insects essential in the fertilization of various food plants and flowers. Much more needs to be known as to strength, dosages and methods of application before Swarthmore housewives—or any other housewives—can safely use this killer indiscriminately, yet some has now been released for public use. DDT packs such a punch that its gloves should be properly padded before it is allowed in the ring.

EVIDENTLY intended to be funny, the following item appeared under the heading "Believe in Signs?" in the *Washington Daily News:*

> SEATTLE, July 21—A typographical error on the office directory of the Smith Tower in Seattle startled passersby for months before it was corrected. One of the signs read: "Room 507, U. S. Fish and Wildlife Service."

We have always prided ourselves on having a sense of humor, but the delicate nuances of this bit of side-splitting fun, which seems to have struck the copy desk as amusing, completely escapes us. We would be inclined to offer a copy of Joe Miller's classic joke book to anyone who can show us the laugh in this item. R. W. W.



# October

*By* ALLEN E. WOODALL

What can we ask more than a day
That sets gold leaves against the gray
Of rain worn walls, or on a sky
Bluer than lakes where white gulls cry,
And calls the yellow sunlight through
Thin branches groping for the blue.

SUNSET GAP FROM KATE'S MOUNTAIN, WHITE SULPHUR SPRINGS, WEST VIRGINIA. PHOTOGRAPH BY CUMMINS.

**Memories of the "sweet spring" of the black-capped chickadee; the matin overtures and the vespers of the olive-backed thrush; bright gold of balsam gilding the hillsides, return when October, the time of fulfillment, comes to the wildwood.**

# Fulfillment

*By* JOHN LINDSEY BLACKFORD

*Photographs by the Author*

HALF that autumn touches turns to gold. But as I wander down October's aisles, it seems to one who has followed bird notes through summer, spring, and fall, that all of what the year has brought has turned to gold. The flame-red banners of the sunset fade to rose, to pink, to pearl; the aureate raiment of the forest casts over one—doubly now—the spell of magic unreality. One senses that this is the year's end, the season of completion, of fulfillment. While the birds are yet going, before winter silvers the wildwood, we recall with full poignancy the symphony of song that the seasons have brought us.

Back to our ears in memory like the pipings of elves or the bells of fairyland comes the "sweet spring" of the chickadees. Of all wood notes it is surely the most precious. Coming so eerily, so fancifully, in March from out the drab forest, it recreates for us the enchantment of woodland; tells of peace and simple beauty.

In spring the antiphonal piping of red-breasted nuthatches became longer, louder, and more insistent as they hitched up and down their rough bark avenues.

Recollection takes us back to an April morning, into a dark, steep-walled ravine. Mighty hemlocks bend down their great, softly-needled boughs to us. Huge arms of the giant cedar spread frond-like branches overhead. Western yew grows densely in the bed of the ravine, the surging, icy melt water bathing its vital green. Then through the moist shades of the mountain solitude ring the silver notes of that flautist of the forest, the varied thrush. His is a reed-like note, tremulous or clear, possessing the quality both of magic and of mystery—mystery that haunts the soul.

Spring renewed in the meadowlands and field

**In the heat of summer, when all other minstrels have retreated to the deepest shade, the sweet recitative of the red-eyed vireo is more than a song; it is a benediction.**

borders the golden voice of the meadowlark. His liquid melody comes to us across the seasons, the distilled ecstasy of morning, the purified essence of the vernal year.

In camp blankets at dawn we heard from tall aspens by the river the wild squawk of the red-naped sapsucker. It is a thrilling primitive cry, one that partakes greatly of the same primal element that makes the pileated woodpecker's call the perfect expression of the untamed wilderness.

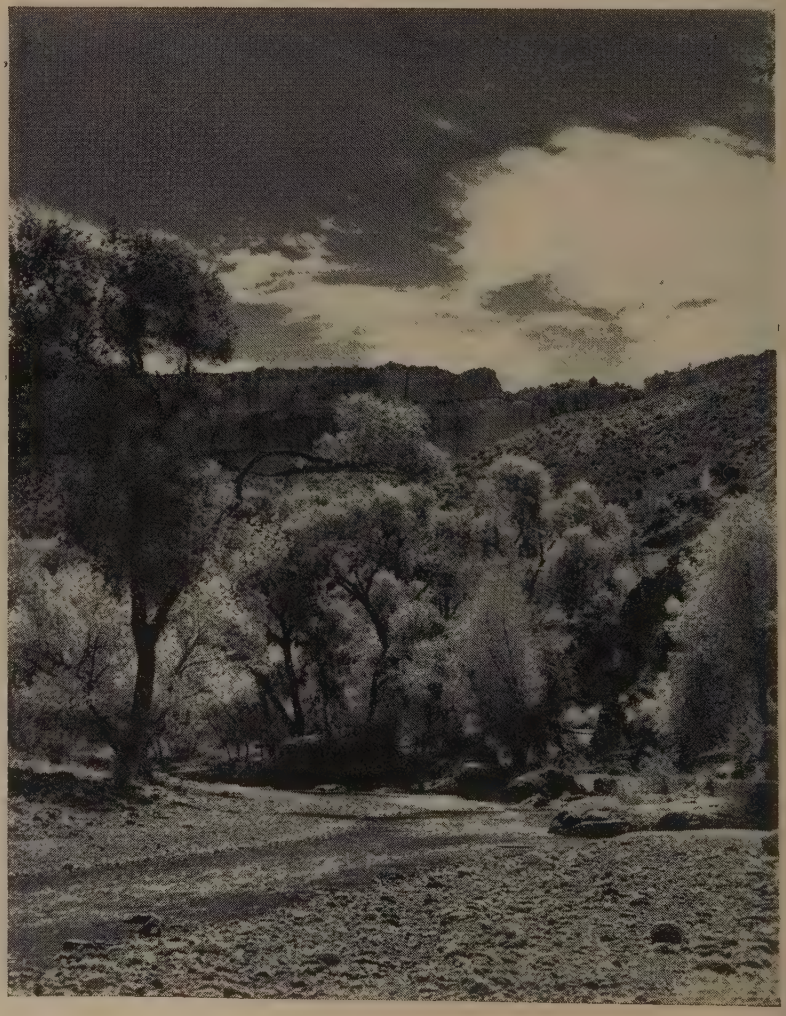
Do you recall the pinelands in May? With only the thought the months between vanish, and we are there. Lofty, russet-red columns of yellow pines soar upward into brilliant sunshine. Thin, waving bunch-grasses ripple before the breeze. White clouds pile up over the hills. Mertensia and wild larkspur flaunt with cinquefoil and purple geranium. Silky lupine is just beginning to spread its fields of blue.

Yet it is the song in the pines that captivates, the song of Cassin's purple finch. Days are bordered and filled with the fast-flowing melodies of this mountain troubadour—rapid, pouring medleys, free, unrestrained carollings that gush from the throat of the singer and from the very heart of spring. All bonds are broken, all cares forgotten; rejoice.

Down the bowered driveway in May we heard the lyric rondels of the warbling vireos, voicing the ecstasy of their glad return. Later, upon his pendant nest or close from among the shimmering leaves of the trembling poplar, the warbling "greenlet" encouraged a brooding mate with melodic roundelays, liquidly tinkling merry-go-rounds of song.

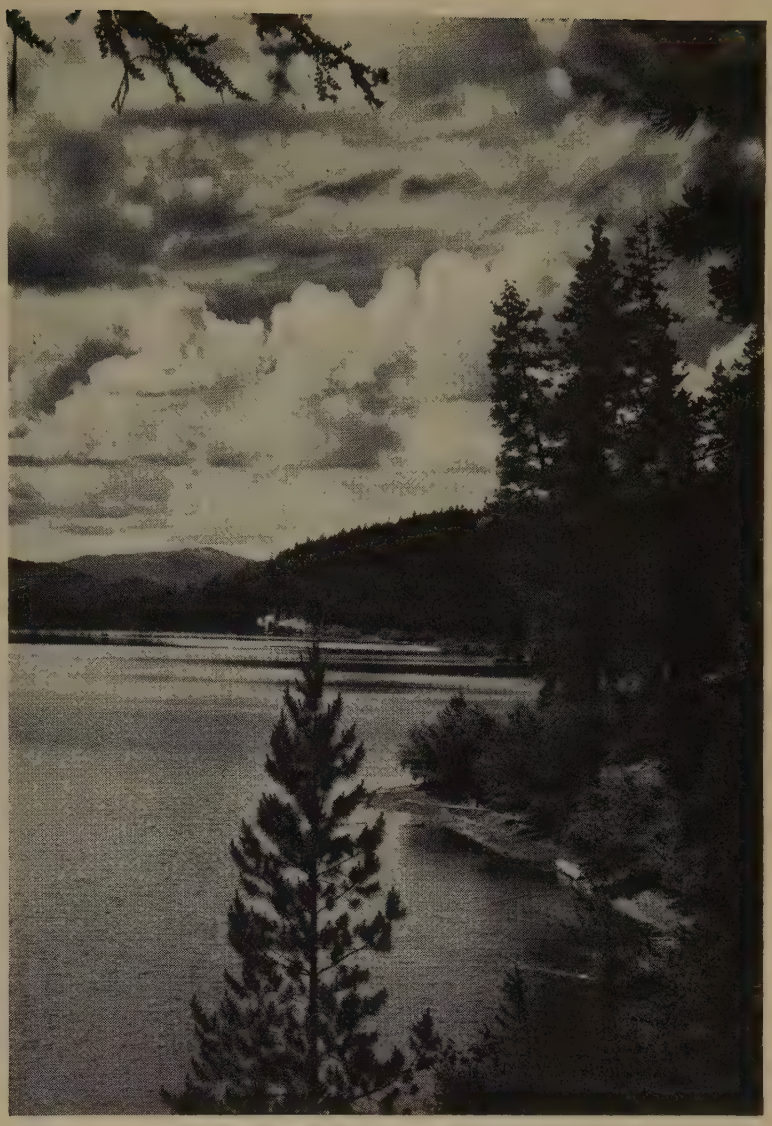
Bullock's oriole is glimpsed most often among cottonwood groves, but memory recalls him last by a river amid conifers. The evergreens were clustered in swales and draws of the bordering foothills. Golden acres of balsam root bloomed upon the slopes, gilding the upland. Then, in the dense green of the fir growth, I caught the bright orange and black of gorgeous plumage, heard the rollicking notes of its wearer. With that floral counterpart of bright gold upon the face of the emerald hills, and that singer of surpassing color there beside the balsam, the wide, rolling uplands with their spaciousness and peace captured the heart.

Evening, sunset, and our recollections—as we sit by



**Bullock's oriole is glimpsed most often among the cottonwood groves, but memory recalls him last by a river amid conifers. A singer of surpassing color, he adds both space and peace.**

**The stirring calls of the honkers are of those things to which we thrill instinctively. Their cries are inseparably part of the boundless lakes and marshes; their high, eternal skyways.**



the campfire in painted autumn woods—bring back vividly the sundown of another day claimed by May. The sinking sun is reflected as a fiery ball and path of flame upon the wide waters of a jade-green lake. Back of the tules and willows rises the forest wall. From amidst brown stalks still belting the lake's marge lift the high, racketing cries of red-necked grebes. Again and many times in remembrance I hear the wild wailings of those elusive divers.

With June we knew the jaunty song of the tanager, colorful upon the fast widening pattern of avian music. Then, too, were we rewarded with a choral long awaited, the matin overture and vespers of the olive-backed thrush. Spring and summer are seasons of hope. Thus they are voiced in the songs of most birds. Yet, although singing at this time of year, this thrush seems to express largely the fulfillment of desire. How like magic is memory! Again we listen to that silver song of summer in this, the golden fall.

About us is the glory of autumn, welcome indeed as we recall the heat of July. Yet the recollection is not without thought of a blessing. Song is ever blesséd, but the clear, sweet recitative of the red-eyed vireo, rendered through day after day of withering heat, was more; it was a benediction. When all other minstrels had retreated to deepest shade, when the sun was no longer the source of life but its affliction, little "nest hanger" bestowed his blessing unceasingly. Everlastingly refreshing were those clear and cheering phrases, coming to us when exhaustion was more than of the body, being of the soul as well.

We need never to recall the song of the hermit thrush. Once heard, that sublime avian voice is forever ours. As dusk draws on, enfolds his dark ravine, we hear him, an angel chorister. It is of love lost and love regained, this choiring; of bliss surpassing, of faith unfailing, of devotion immortal. We know the ecstasy and pain of limitless joy, the acceptance of unmeasured sorrow. For all time we know the rapture and passion and poignancy of love, the relief of tears, the hope everlasting.

And last, as we gaze into the embers of October's campfire, we recall the hurrying hosts of southward migrants. There are among them those lords of waterfowl, the

**In spring the antiphonal piping of red-breasted nuthatches became longer, louder, and more insistent as they hitched up and down their rough, bark avenues.**

gray geese. We see their quivering crescents high over some wide blue bay, or driving on under darkening clouds. Others, still to pass, are barely glimpsed in November's shrouding mists. We count the stirring calls of the honkers among things we thrill to instinctively, yet can never adequately describe. Their cries are inseparably part of their boundless lakes and peaceful marshes, their high eternal skyways.

Now the embers are dying, their bright glow has faded. A restless wind scatters in abandon the golden leaves. The year, too, is dying. Yet we shall never forget them, those wondrous avian voices. Songs they are of eternal verity, notes that remain forever vibrant. This was the year's promise; all this, and more, was the year's fulfillment, at once Nature's gift of memory, her promise for tomorrows to come.

# A Natural Water-Garden

*By* ALEXANDER F. SKUTCH

The low, flat country lying between Almirante Bay in western Panama and the Costa Rican border is intersected by innumerable lagoons of sluggish flowing or stagnant water, occupying old beds of the Changuinola, the Sixaola, and other smaller rivers that flow down from the high mountains in the south. When the flood waters cut a new channel for themselves, as they not infrequently do, the former stream bed is left as a lagoon filled with still water. Most of these lagoons have extremely tortuous courses; they form a perfect labyrinth in which the voyager in his dugout canoe may easily go astray, if not familiar with all their turns and twists.

The vegetation along these lagoons is lush and heavy. The shores are lined with giant canes ten or twelve yards in height, heliconias and shell-flowers, each of whose ample leaves would suffice to cover the family dining table; and, in places, especially near the seashore, with silico palms in almost pure stands, their huge fronds, forty or fifty feet in length, arching gracefully over the dark waters like gigantic ostrich plumes. On the higher ground bordering the waterways were once flourishing plantations of bananas and cacao, but most of these have long been abandoned and have grown up into tall, second-growth woodland, the home of howling monkeys, coatimundis, peccaries and tapirs. Herons, egrets, coots, jacanas, gallinules, kingfishers and birds of many other kinds swarm along the channels; great alligators lurk in the shallows; and now and again a big tarpon breaks the surface, its broad scales shining silvery in the sunlight.

In the shallows along the shores and across the stiller reaches of the lagoons float innumerable plants of water-hyacinth, *Piaropus azureus*, with showy clusters of big blue blossoms, each with a yellow eye; and of water-lettuce, *Pistia stratiotes*, whose flowers are small and inconspicuous. We found the surface of one of the shorter lagoons completely covered over with these two water plants. The taller, dark green water-hyacinth had been drifted by the wind into long, gracefully curving rows; and all the space between was occupied by the lighter green of the floating water-lettuce, whose hairy leaves lay close above the surface. It reminded me of a quaint, old-fashioned formal garden, in which the flowering water-hyacinth took the place of well-trimmed box-wood hedges, and the water-lettuce formed the velvety turf—lawns over which only the long-toed, spur-winged jacanas could walk without wetting their feet. And the wind was the playful gardener who had planned and who had executed the fanciful design.

*Man fights a continuous and often discouraging battle against—*

# Plant Diseases that Have Made History

*By* E. E. STANFORD

**Spur-like, poisonous but medicinally valuable masses of the ergot fungus have replaced some of the grains of rye in these heads. They are shown at the right in comparison with grains of rye above.**

U. S. DEPARTMENT OF AGRICULTURE PHOTOGRAPH

HUMAN history is scarred by pestilences—plague, malaria, typhus, tuberculosis, and many more. Everyone knows something about human diseases, but that plants may be sick scarcely occurs to most people who do not handle them. When plant disease is mentioned, the "average man" probably thinks of it vaguely as something that concerns only the farmer and the agricultural specialist—the "plant doctor." Such scientists do deal with with these ills, and with increasing success. Yet after nearly a century of increasingly intensive scientific study, fungi and bacteria still shorten our crops of rationed food, damage and destroy our forests and shade trees. In the yesterday, when their causes were still mysterious, these pestilences were "visitations of Providence" that starved thousands, impoverished hundreds of thousands, brought about migrations of peoples, and forced great crops to cross wide oceans.

Causes of most plant disorders are now quite well understood. Relatively few of them—the viruses—elude the microscope. On these we focus the marvelous means of biochemistry; we measure and photograph them with the new-found resources of the electronic microscope. And still we are not quite sure whether the particles that cause mosaics of potato and sugar cane, or the curly-top of beets, are really alive. But the causes of most plant plagues are only too evidently living. A few are bacteria: noxious midgets that blight pear trees and choke the water-tubes of huge, succulent tobacco plants. But the majority are fungi, more or less like the newly-famous *Penicillium*—which itself will rot an apple quickly enough. Their bodies are microscopic threads—half a hundred, side by side, scarcely equal the thickness of a leaf—slender, but stout enough to live by higher plants' damage and death. They dust shriveled leaves of grapes; corrode stems of forest trees; powder blasted fields of grain with black and gold. These powders and dusts are spores—microscopic spheres or ovoids, borne literally by the million, that spread by means of wind and rain-spattering, insects and human handling. A spore may germinate in a drop of dew, forming a new fungus thread to pierce a leaf or ruin a fruit. Lack of sunshine and wet weather favor the growth of fungi. The worst epidemics of plant disease are likely to occur in warm rainy seasons.

Before and since the dawn of history, crop failures brought human starvation, disease and death. Ancient Greeks and Hebrews and Romans had no microscopes. We cannot be sure now whether smut or rust fungi or simple drought smote the "seven ears, withered, thin, and blasted with the east wind" of Pharaoh's dream that foretold the years of Egyptian famine. If we span some tens of centuries, medieval records tell of the "Holy Fire"—a succession of epidemics of ergotism that swept central Europe at various times, from the late Roman period almost to the present day. Ergot is a fungus that strikes the flowers of cereals, particularly rye. In lieu of the grain there develops a spur-like, purple-black, fishy-smelling monstrosity half an inch or more in length. The poison of this "spurred rye" is valued in modern medicine, but ground in the meagre loaves of old-time Europe it brought on a progressive and horrible gangrene, which rotted fingers, toes, whole limbs even, and sometimes ears and face until death afforded release. In other cases the nervous system was affected; convulsions, delirium, and death followed. A devastating outbreak of ergotism occurred in France

ILLUSTRATIONS FROM U. S. DEPARTMENT OF AGRICULTURE

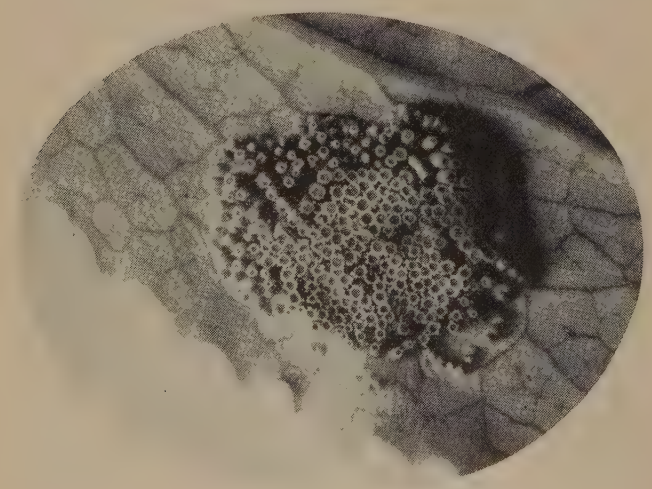
**Ellipsoid golden-red summer spores of rust emerge from the blasted stems of wheat and quickly infect neighboring plants. Like microscopic shells leaded with another year's disaster, dark winter spores (center illustration) appear among the gold of summer. In spring these projectiles (right) do not need to explode. They simply germinate, and the wind whirls away the tiny sporelets to attack barberry bushes.**

as late as 1816. Still more recently, an epidemic was reported in Soviet Russia in 1926-1928. Medieval Europe kept no exact vital statistics, and any estimate of ergotism's death toll would involve a good deal of guesswork. But probably no other plant disease has directly produced so much human suffering. Modern methods of grain-winnowing and milling rid harvested cereals of ergot. On grasses as well as standing grain, however, the fungus is still a dangerous poison to grazing stock.

Better known because more recent than the principal ravages of ergotism, another concentrated havoc of plant disease was the Great Irish Famine of 1845-1847. In the middle sixteen-hundreds, what a retrospective Irish writer terms "that demoralizing esculent", the potato, had become the Irish national food. Potato culture proved the line of least resistance in a poverty-stricken land. The tubers yielded more than three hundred bushels to the acre—four times as much food as other Irish crops. "The labor of one man could plant potatoes enough to feed forty." Before the spreading culture of the potato, wheat, barley, and oats, old time staples of Irish culture, deteriorated in quality and quantity. Landlords, furthermore, took most of the cereal produce for rent. "Green crops," says an Irish historian, "were all but unknown."

History shows that intensive reliance on any crop—rice in the Orient, cotton-for-cash (or credit) in our South, invites disaster. After the introduction of the potato there had been frequent disastrous crop failures in Ireland, but in spite of these "the wretched people multiplied on their plots with perfect recklessness." Population increased from about 2,846,000 in 1785 to some 8,295,000 in 1845. Ninety-five percent of all these millions, with such pigs and poultry as they possessed, were nearly one hundred percent potato-fed.

The disease that caused the "Potato Famine" may have started, like the crop it ruined, in South America. Some say, more likely in Mexico. It appeared in America and Europe about 1844, and smote the crowded fields of Ireland a year later. As the tubers formed underground, the foliage became brown-spotted, soon looking as if scalded. Visible white mold-tufts appeared beneath the leaves. The vines decayed with an evil odor; the wind-blown breath of a dying field was perceptible at some distance. Tubers ceased growing; those that did mature rotted by the



**From tiny cups on this barberry leaf spores blow away to germinate on the stems and leaves of wheat, thus to carry on the cycle and to cause loss in a vital cereal crop.**

thousands of bushels in their storage pits. Almost a third of what would have been an unusually large potato crop was lost. Irish cereals, fortunately, bore excellently in 1845. Suffering, while widespread, fell far short of the famine-disaster of the following years.

Scientific study in England and continental Europe presently revealed the fungus cause of the plague, but the Irish peasantry did not read scientific journals. It would have done them little good if they had, for the naturalists who studied the fuzzy tufts, with their microscopically lemon - shaped spores, made suggestions enough, but devised nothing to stop the pestilence. Ireland, to be sure, did not suffer alone. All through England and northern Europe the potato fields went down, and suffering was widespread. Had these larger areas gone all out for the one-crop economy of Ireland, the resultant disaster would have shaken civilization.

Short crops of past Irish history had often been followed by abundance. Hopefully, in 1846, the famished peasantry planted a huge potato crop. Up came the sprouts, greening luxuriantly, blossoming profusely. But July and August brought heavy rain with dense, frequent, night-fogs—ideal weather for spread of any sort of fungus. Once the blight appears under such conditions, the microscopic spores spatter and blow by millions and billions. They germinate on the leaves of healthy plants, forming threads that permeate and destroy leaf tissue within a matter of hours. Thus the disease spreads like wildfire.

**Scientists experimenting with the potato blight determine resistance by exposure to the disease. The ruined tuber below is a Green Mountain, a famous variety but sadly susceptible to blight fungus. The undamaged spud is a resistant strain developed by the United States Department of Agriculture.**

Father Mathew, the temperance reformer, traveled from Cork to Dublin in late July of 1846. Along the way, "this doomed plant bloomed in all the luxuriance of an abundant harvest. Returning on August 3 I beheld with sorrow one wide waste of putrefying vegetation . . . the wretched people were seated on the fences of their decaying gardens, wringing their hands, and wailing bitterly the destruction that left them foodless." Other writers of the period also stress the suddenness of the outbreak. "The face of the whole country was changed; the stalks remained bright green, but the leaves were all scorched black. It was the work of a night." Potatoes on blighted vines grew little larger than marbles; they remained unripe, unfit to eat, and soon rotted. Throughout much of Ireland, the crop was a total loss. In 1846, grain crops were scant not only in Ireland but throughout northern Europe.

In the wake of the Irish blight followed famine and human pestilence. Thousands—nobody ever knew how many thousands—sickened, starved, and died. "Work relief" projects, soup kitchens, importation of corn from America, public and private charity, did what they might in a world where yet the Red Cross had not arisen to aid each man as his brother's keeper. At one time during this famine more than one-third of the Irish people were on various forms of "work relief," and more were on outright charity. The distress of Ireland was a major factor in the abrogation of the British "Corn Laws," the high-tariff provisions of which had virtually closed British and Irish markets to grain from the outside world.

In 1847, perhaps one-sixth the normal acreage was planted, and again the blight was severe. After 1847, conditions slowly became more normal, but in 1853 the Irish population had shrunk to about 6,200,000 —a decrease of one-fourth. Many had died, but the principal loss was through emigration. Nearly one million and one-half Irish, it was estimated, came to America in that period—a huge movement of population that continued, although less rapidly, for decades, with the United States the chief magnet. By the turn of the century, the population of Ireland was little more than half its figure in 1845. Since Jamestown and Plymouth, there have been few more portentous move-

U. S. DEPARTMENT OF AGRICULTURE PHOTOGRAPH

**Leaves spotted like this cut down the badly-needed wartime rubber production of Brazil. Earlier it had caused the western migration of rubber.**

PHOTOGRAPH COURTESY OF COUNTRY GENTLEMAN, © CURTIS PUBLISHING CO.

**A power sprayer does a wholesale job of protecting an American potato field by a liberal and effective distribution of fungicide against the potato blight fungus.**

ments of peoples than the great Irish exodus. West of the Statue of Liberty (which was not there in 1846) the refugees from the potato famine have tilled our fields, paved our streets, built our railroads, and altered the political complexion of cities and states.

In Ireland today, as elsewhere in potato-growing regions, the nature of the fungus that causes the potato blight is thoroughly understood. Careful culture, use of resistant and early maturing varieties, assiduous spraying with a "Burgundy Mixture" of copper sulphate and washing soda, and avoidance of injury and infection in harvest, all help to hold the disease in check. Diversification of crops not only lessens famine danger but affords Ireland a better based national economy.

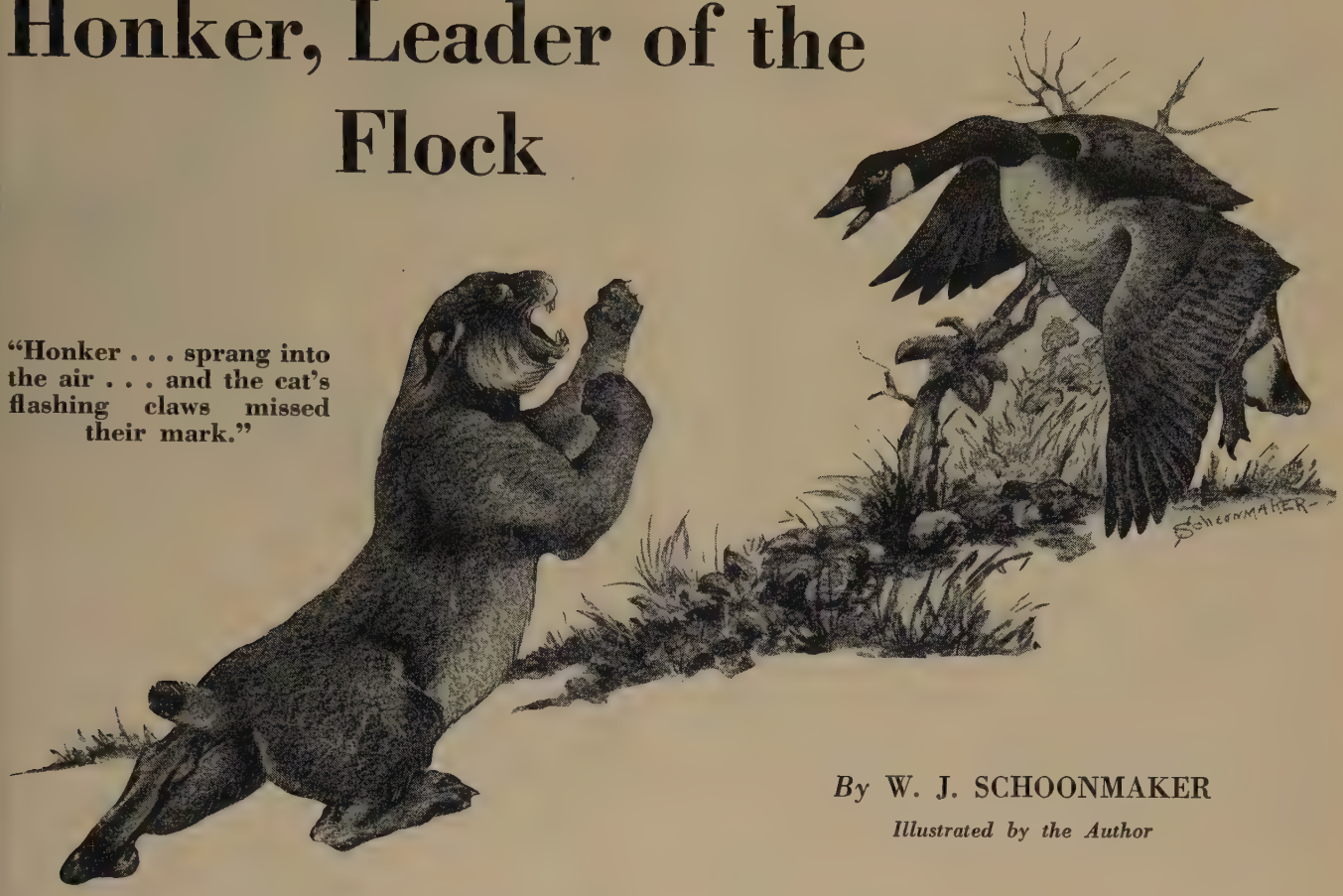
While in more recent times, and in other areas, potato blight has caused plenty of trouble (losses in Vermont in 1901 ranged from 65 to 95 per cent of the crop), there have been no more potato famines. American losses have, to be sure, sometimes exceeded 30,000,000 bushels, and even quite recently have averaged around 9,000,000 bushels a year. But for years our agricultural scientists have been working for ideal potatoes that would combine high yield and cooking quality with hundred percent blight resistance. Commercial potato culture stretches—with a good many great open spaces between—from Maine and Florida to Colorado, Idaho, Oregon, and California. No one variety can adjust itself equally to all the varied climates and soils of such a range. In the Old World the breeding of a really resistant potato "stumped" no less a scientist than Darwin. English, German, Russian, and other potato-breeders, as well as American, have had better luck with this problem of great genetic difficulty. Careful species hybridization has yielded promising results; the most resistant "blood" seems to come from Mexican potato relatives with little but this to recommend them. Working Mexican resistance into the constitution of spuds with high crop and quality values has produced some valuable potatoes, and also thousands, if not hundreds of thousands, of headaches.

The Sebago potato, introduced as recently as 1938, is highly blight resistant and adaptable to many American areas; it is now being produced by the millions of bushels. New York scientists have an Empire variety, which they prize highly. This year, just a century from the beginning of the Irish disaster, two "tailor-made" varieties believed to be fully resistant not only to blight but to another disastrous disease, leaf-roll, are being distributed from the Beltsville Research Center of the United States Department of Agriculture to experiment stations and chosen potato-men throughout the country. These have been developed during a ten-year period from resistant seedling stocks, cross-bred and re-bred with non-resistant varieties of top yield and A-1 cooking quality, until the best attributes of all have been fully combined in these offspring. They will probably soon be available to seed thousands of acres of commercial fields.

Far in the "back of the before" of ancient history have been lost the earliest records of stem rust of wheat. This may have been the "blasting and mildew" of Hebrew writers. Aristotle, Theophrastus and Pliny wrote of grain rust, and in the spring Romans propitiated a rather diabolical diety, Robigus the Rust-god, who blasted their fields with more regard to weather than to incense.

Stem-rust is as widespread as wheat-culture. Like most fungus diseases, its inroads vary with localities and seasonal conditions, being in general worst in periods of warm moist weather. Fungus-threadwork within stems and leaves bulges and ruptures them, causing excessive water loss and interfering with vital processes of food-building. Orange-red summer-spores form in these wounds. Wind spreads these spores, and, under favorable conditions, the rust travels like fire in a dry forest. In the world's wartime need of 1916 it cut United States (Continued on page 440)

# Honker, Leader of the Flock



"Honker . . . sprang into the air . . . and the cat's flashing claws missed their mark."

*By* W. J. SCHOONMAKER

*Illustrated by the Author*

A STUBBY tail twitched nervously; fierce yellow eyes bored through the tangle; then a short spurt, a mighty leap and the wildcat was bearing down upon the great Canada goose. Honker, leader of the flock, fled when the rush began, ran with flapping wings and outstretched neck, sprang into the air, climbed frantically into an azure sky, and the cat's flashing claws missed their mark.

Hundreds of wing beats filled the air as the entire flock joined their leader, circled once the danger zone, and headed into the spring breeze that blew from the land of the North Pole.

High they flew, winging their way in a great wedge-shaped formation, over village and city, valley and mountain, river and lake; honking, babbling, excited, wild and happy. Ice still covered some of the ponds, and the wood frogs had not yet began to croak, but this flying wedge, pressing toward the Arctic, was a promise of spring.

The earth people thrilled to the clangor and many gladdened hearts responded in ways that were not understandable. Strong men yearned to wander—destinies unknown; the city-bound cried for freedom, and youth pined for love, because there is something in the call of the wild goose that is mysterious and stirring, saddening and gladdening, alluring and thrilling; a something that men hear and stir to, yet can not explain.

Onward, the feathered visitors to the great northern wilderness flew until Saratoga Lake, cold and blue, yawned below. Rafts of ducks rested on the water, and, as the great wild geese slanted down, their smaller cousins welcomed the voyagers with excited babbling and quacking. Mallards, black ducks, golden-eyes, buffle-heads and the saw-billed fish ducks, as well as grebes and loons, awaited the migrants. All mingled, friendly and contented, and a bald eagle soared above.

Soon after dawn the next morning, the flock resumed its journey, driving swiftly ahead to a land where the great birds would swing away in pairs to find a place that would be theirs alone—until the eggs hatched.

Honker, the gander, with Gray Mate, swung over the low spruces of the northland and dropped into the beaver pond that had been their summer home for three seasons. For the geese it was the love moon, and with necks entwined they rubbed cheeks and rejoiced.

Soon the nest, a mass of twigs and weeds, was completed. It was fully exposed, and on the very top of the beaver lodge, but there was nothing to fear, for the pond was far from the trails of men and the nest, surrounded by water, was difficult to approach.

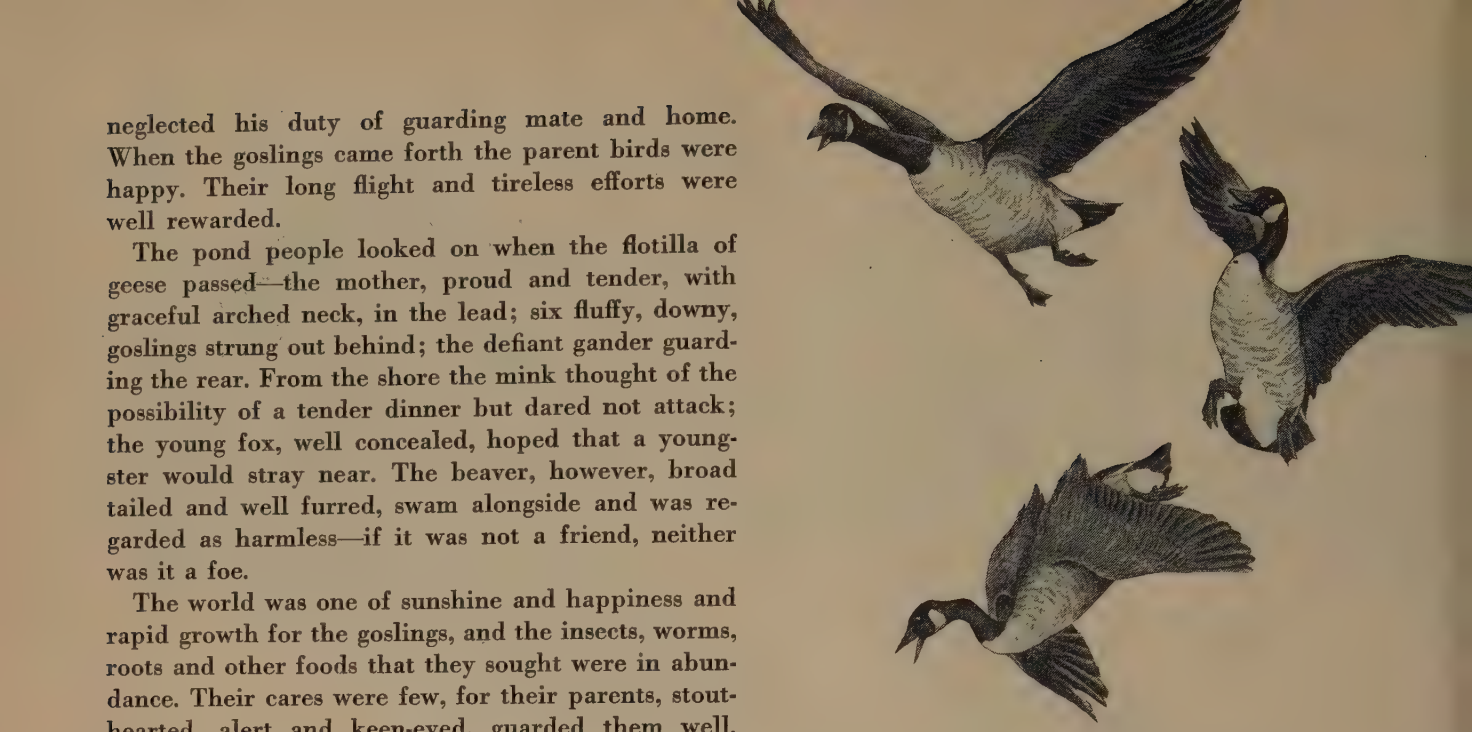
Late in May the eggs were laid, six yellowish-white, precious eggs that were to be the pride and treasure of the white-cheeked pair, but only after a full month of constant attention and vigil. Gray Mate was patient and seldom left the nest, and the great black-necked gander, alert and watchful, never

neglected his duty of guarding mate and home. When the goslings came forth the parent birds were happy. Their long flight and tireless efforts were well rewarded.

The pond people looked on when the flotilla of geese passed—the mother, proud and tender, with graceful arched neck, in the lead; six fluffy, downy, goslings strung out behind; the defiant gander guarding the rear. From the shore the mink thought of the possibility of a tender dinner but dared not attack; the young fox, well concealed, hoped that a youngster would stray near. The beaver, however, broad tailed and well furred, swam alongside and was regarded as harmless—if it was not a friend, neither was it a foe.

The world was one of sunshine and happiness and rapid growth for the goslings, and the insects, worms, roots and other foods that they sought were in abundance. Their cares were few, for their parents, stout-hearted, alert and keen-eyed, guarded them well. But even the mightiest may err or be caught off-guard, and one day, as the family fed far from the edge of the pond, an enemy stalked toward them with an ease and stealth unequaled in the vast northland. With ears laid back, the great Canada lynx approached on large padded paws to within two bounds of an unsuspecting gosling. The set was perfect, the kill was sure and the big cat bounded forward.

Honker saw the first leap, raised high and struck a powerful blow with his great wing. It landed solidly, with a force that might have broken the arm of a man, across the eyes and face of the lynx. Hurt, amazed and temporarily blinded, the foe was halted while mother and young raced for the pond. Honker, the father, was not now leader of the flock seeking to escape. His sole purpose was to protect his family, and fearlessly the valiant bird faced the enemy and struck several hard blows. The lynx was young; this was its first year of hunting and the determination of the great bird was too much. With a snarl of rage, the baffled cat slunk off and the goslings were safe.



Seven weeks after they were hatched, the young geese made their first short flight and rejoiced in a new found pleasure. Each day thereafter the entire family, headed by Honker, took flights that ever increased in distance, and by mid-August the young birds were strong fliers and ready to begin their first journey toward the warm southland. Honker and Gray Mate were proud, and their black eyes shone with satisfaction as they looked upon their six sturdy offspring.

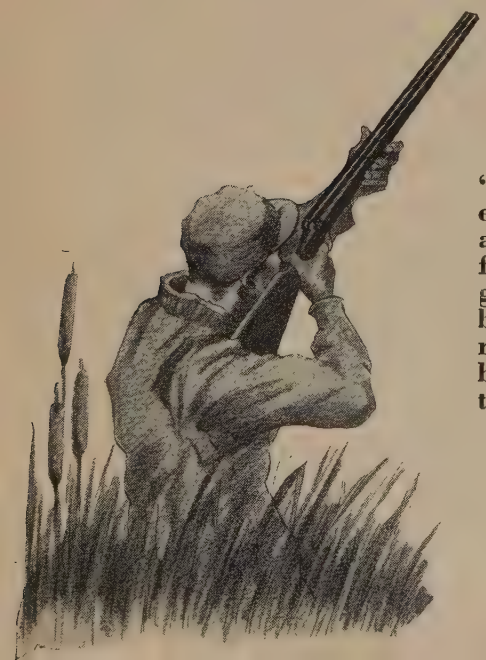
Soon came cold frosty nights, the maple leaves grew brighter, and skim ice fringed the pond. Honker and Gray Mate became uneasy. The journey of peril and sorrow was at hand, and early one morning the family of geese flew south to the big lake where hundreds of other great, black-necked birds had already congregated. The autumn migration of the Canada goose, one of the finest and wisest of waterfowl, had begun.

Slowly at first the huge flock moved south, from lake to lake and river to river, stopping often to rest and feed, for intense cold was not yet forcing their flight.

The journey was pleasant and peaceful; the flock was well fed and vigorous. The young birds, joyful and amazed, followed cheerfully the will of Honker, leader of the flock. But peace for the wild folk is not for long; not near the haunts of man.

One night they slept contented, unworried; the next, at dawn, began a lasting terror—the terror of the hunting season.

At the first shot the great flock took off as one bird. High toward the heavens they climbed and peered down with keen, black eyes upon two of their kindred that would never again obey the commands of the majestic Honker. And they saw more than that. Carefully concealed in the wild rice and flags the circling



**"The bushes moved, ever so slightly, and Honker's watchful eye saw the gleam of steel gun barrels . . . Four rapid shots roared behind them and two of his followers dropped."**

band observed dozens of hunters emptying their guns on small flocks of bewildered ducks and mud hens, snipe and yellowlegs. They saw many birds stop in their swift flight, crumple in the air and fall with a tiny splash on the blue water. They heard the sharp reports of hundreds of shots. The geese of the year—youngsters of the flock—twisted their lovely necks and with terror-filled eyes beheld the murder scene below, as man the mighty greeted his feathered and distant brethren.

Brave hearts beat rapidly as the huge flock formed a wedge and headed again toward the land of warm breezes. But this was not the determined, anxious rush of the Canada goose in the springtime, heading toward a summer home and a life of love. This flight was forced by winter, which closes the waters and seals in ice the foods of the waterfowl. And this flight was filled with constant watchfulness and restlessness, for at every point and feeding ground danger and death lurked. The first danger was now far behind and the birds were speeding on. The lines of the wedge often wavered and broke, for many of the flock were young birds that had never before followed the long southward course. Neither had they arrived at their full strength, and too often the flock was forced to face dangers so that the tired ones might rest.

For weeks the journey continued over a hostile land, and the numbers of the flock were tragically reduced. The greatest loss, however, was suffered in the sunny state of South Carolina.

The flock was tired. Honker knew that, for he too felt the strain of the long forced flight, added to which was worry and terror. So, when a small flock of his kind called from the rush-fringed waters, the great leader circled once, then set his wings and the whole flock spiraled down. Over the rush tops they swept and their excited kindred "honked" a welcome. The bushes moved, ever so slightly, and Honker's watchful eye saw the gleam of steel gun-barrels. His warning was not terrifying. Yet it was urgent, commanding, and the flock climbed. Four rapid shots roared behind them and two of his followers dropped. On sped the others and the scene faded while the decoys—victims of man's craftiness—honked and pleaded and fanned the air with clipped wings. But the slender chain that anchored them fast did not yield and, try as they might, they could not follow their disappearing kind.

"Soon the nest, a mass of twigs and weeds, was completed."

Honker looked back. The wedge had formed; the flight was strong. He turned to the left and on his flank was Gray Mate—but something was wrong. Even as he looked, death came and his valiant mate plunged to the open water below. The old gander dropped and the flock followed. Around his mate he swam, talking, pleading, low and sorrowful, but to no avail. Night settled and the wise birds waited while Honker, their leader, mourned his greatest loss.

Morning stirred them and the old gander looked about. He did not, however, look upon his mate, for during the night her cold body had drifted shoreward and was now tucked among the reeds.

The flock babbled and Honker felt their restlessness. They must go on, and with a stout though sorrowed heart he gave the command.

Their course was dangerous and trying. Foes seemed to be everywhere and hundreds of charges of shot tore through their ranks. Many fell and some struggled on, sorely wounded. Then, as though a truce were declared, another hunting season was past.

The geese mingled with others of their kind, as well as with great flocks of ducks and other birds that had escaped the hunters' death. Together, on peaceful southern waters, they waited for the call of the northland.

The call came. None heard it but all felt it, and the Canada geese crowded close to their leader. Quiet and still, like a statue, he stood—listening, watching, hoping. Then, as though he could bear it no longer, Honker, lord of the flock, called once—clear, loud and trumpet-like. His flock thrilled and stood tense; then they rose and slanted steadily toward the north. Eager and strong and joyful they were—all but one, their gander leader.

The great northland was reached and pairs swung off alone. Honker dropped into the beaver pond that had been his summer home for some years past. With a lonely heart he swam silently about. For days he pined, and often he stood for hours on the old beaver house, motionless, silent, sad and alone.

The Canada goose mates only once, but mates for life. Should one pass on, the survivor is doomed—like Honker—to a life of loneliness. His very staunchness is his greatest burden, and with a brave but lonely heart the old gander waits to lead the flock—his children and theirs—back over the safest route he knows.

# Measuring Midway for a New Green Gown

*By* EDWIN D. NEFF

*Official U. S. Navy Photographs*

DREAMY, sun-washed Hawaii has always taken her monopoly on the Pacific tourist trade for granted. She may wake up one morning to find, in peace, that she has a brand new and vigorously competitive "Paradise of the Pacific" right at her own back door—two grains of sand at the north end of the Hawaiian chain called Midway Islands.

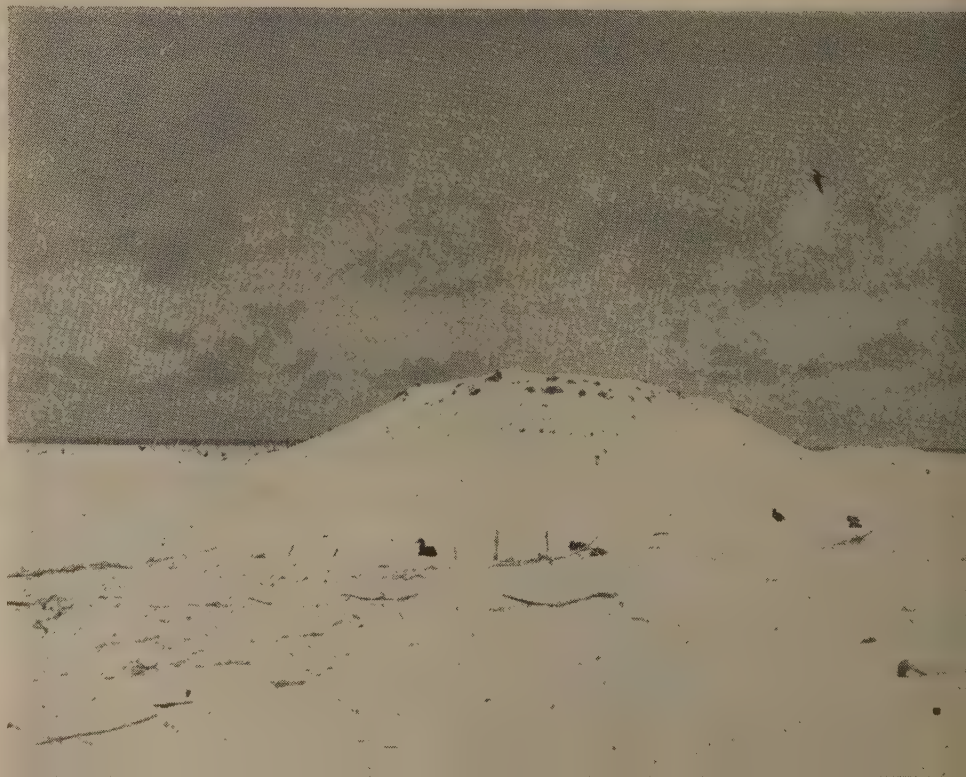
The U. S. Navy and employees of the Commercial Pacific Cable Company will be the sole inhabitants for the duration, but it seems quite probable that Midway will make a strong postwar bid for tourists. Magnificent game fishing, a climate equal to Bermuda, and the strange and beautiful birds have always belonged to Midway. Even before the war Pan American Airways was providing regular plane service from Hawaii. But the big drawback were the islands themselves. There are two—Eastern and Sand Island. The first was partially covered with scaevola bushes before the arrival of man, but Sand Island was almost entirely bare, excepting for one corner planted by a far-sighted cable company.

Today the picture is changing. Midway is being measured by the Navy for a new green gown.

When you approach the islands from the air you can see the green of trees. Coming in to land you may spy a sprinkling of flowers among the trees, and even landscaped lawns neatly trimmed with shrubbery. Once aground you will be astonished at the cable company's garden, after a grim walk past the sand dunes that line the runways. There are coconuts, bananas, papaya and limes, and among these struts a gorgeous Chinese pheasant. Nearby is the plant nursery—once the company's vegetable garden—now run by the Navy. In the center, and shaded by a banana tree, is a patch of tall, Iowa corn. It is tended by a boy with a Brooklyn accent, who had to be shown where the ears would grow. It is a little bit of America, and it stands as a symbol in the midst of the strange Pacific verdure.

It is little, but it is growing. Incongruous as it seems, the United States Navy is in the nursery business on Midway. In an amazingly short time it has imported 50,000 plants, and during the past year has grown another 20,000. Cool green lawns cover the hot white sand around many of the officers' quarters, and among the great, shifting dunes a regular Navy detail, sometimes as many as fifty men, is constantly planting tough St. Augustine grass and Bermuda grass, ironwood trees and shrubs.

In the nursery, where imported plants are raised and new plants propagated, a professional horticulturist, Alan D. James, is in charge of a special detail. James is a carpenter, first-class, by Navy rating, and he was discovered in the ranks quite by accident. He and his assistants are fighting a new battle of Midway, quite as elemental as the famous one. They are competing with shifting sand, a drying, swift wind that can be furious during winter months, and a complete absence of natural soil. Every ounce of soil used in the nursery and for landscaping had to



**Midway as it has looked since it thrust above the ocean surface. It does for some birds but provides a real challenge for man when he set about to bring civilization, grass and other growing things to this uninviting sandy waste.**

**Iowa corn mingles with bananas in Midway's nursery, where carpenter, first class, Alan James, the island's fulltime horticulturist, has wielded a very green thumb and proved his versatility in the garden.**

be imported, a shipload at a time. Much of it was brought in by the cable company during the past forty years, but occasionally a skipper can be wheedled into using good, rich Hawaiian soil as ballast, even in these days.

The extensive planting program now under way was ordered by Commodore Gail Morgan, USN, Commander of Midway Islands, and he hopes to see the islands green by the fall of 1945. Sometimes, last winter, it almost seemed the islands would blow away before fall.

But the story of man's struggle to make this miniature desert livable begins with the century. The Mackey interests decided to invest a fabulous sum in a cable to be laid across the bottom of the Pacific, by various stages from San Francisco to China and Tokyo. One of the stages was Midway—the cable link between Hawaii and Guam.

On May 7, 1903, a schooner bobbed outside the coral reef which partially surrounds the islands like a broken, shell necklace. Aboard the vessel were the company's technicians and their equipment. They found some Japs already on Midway, busily slaughtering birds for the millinery trade. An entry in the first report from Midway to the cable company tells of hiring Japanese seamen as laborers at one dollar per day to help unload the ship, and of the company's supervisor's somewhat frantic efforts to learn a little of Midway's climate from the skipper of the Jap ship. The latter spoke no English, but could write and read a little Chinese. The company's Chinese cook was thus able to pump a little information from the Jap. In answer to questions about the weather, the Jap placed a wooden box on the sand and surrounded it with planking. He then got down on his knees and blew at the structure.

"We concluded," the report reads, "he was trying to show us how severe are the winter winds, and that some kind of protection would be needed for anything we built."

Another passenger on that first company ship recently wrote a relative of his, now on duty at Midway, of the first night on Sand Island.

"The experience was somewhat startling," he said. "We walked around the island, but not much to see—just reef, sand and ocean. Plus birds. Then as night fell there arose the most astonishing medley of sounds. A kind of weird caterwauling—shrill, catlike screams. Moaning as of women in great distress. We did not know what to make of it. Later we learned all these sounds were made by the sea birds, and we soon got used to

**Man, however, has accepted the challenge of Midway and wrought such a change as this. Through skilled nursery work and determination such greenery as this has come to the island, being carefully measured for a new green gown.**

**One side of the Navy's nursery on Midway. This garden in the desert was once the vegetable garden of the cable company, which pioneered the plantings on the island.**

them as to the noises of a city street. . . .

"The island is comprised entirely of white coral sand. The climate is about the same as Bermuda. Anything would grow in that climate, but there is no soil. For the first two years we tried planting things that might thrive in sand, but, even if they came up, the wind would bury them again. Finally we got some grass from the cliff house at San Francisco. That flourished and held the sand."

By patient experiment and in between their other duties, the company employes began to make their planting stick. More grass was imported. Ironwood trees were planted in a great circle to protect the vegetable garden, and soil was constantly added by the regular supply ships. Another entry in the Midway station's report to company headquarters—this one in June, 1907—states that the Bermuda and San Francisco dune grass were making progress and seemed the best means of holding the sand.

Today the ironwood trees are more than seventy-five feet tall, and they protect the Navy nursery, which has replaced the company's old vegetable garden. Beginning with this tiny Eden, the Navy undertook a steady plant expansion. A careful selection of stock was made in Hawaii and shipped to the nursery. This stock included more than fifty varieties of trees, shrubs and grasses. The beefwood, *Casuarina equisetifolia,* locally called ironwood, and tropical almond, *Terminalia catappa,* were the two main varieties of trees. They were selected because of proven ability to grow in sand, which, incidentally, is rather heavily fertilized by the birds.

The shrubs included seagrape, *Coccoloba uvifera,* which resists sun and sand; *Tournefortia;* Mexican pepper, *Schinus terebinthifolius,* for hedging; bouganvillea; croton, *Codia;* milo, *Thespesia populnea;* canna for planting around quarters; spider lily, *Crinum giganteum,* and *Vitex,* which will grow in sand due to its excellent root system. While some of these are not ordinarily used for landscaping they are practical on Midway.

The Navy has found that poinsettias, lemons, limes, crotons, plumbago, cassia, hibiscus, pluchea, thevetia, tithonia all will flourish in protected areas. The nursery of course uses imported soil and when trees and shrubs are planted around quarters a few spadefuls of soil are packed around the root system. Guano is imported from Hawaii, and the cable company's barnyard supplies manure. James states any commercial fertilizer could be used, and even the coral sand is not entirely infertile.

Two grasses are used almost exclusively for sand stabilization. These are Bermuda grass, *Cynodon dactylon* and beach, or St. Augustine grass, *Ammophila arenaria.* Both are being planted widely throughout Sand Island, together with the hardier shrubs.

The nursery detail is slowly but steadily covering Sand Island with plants and grasses. Many are to serve mainly as sand stabilizers, but the shrubbery and more ornamental lawn grasses are gradually converting a growing area into cool, green landscaping. Already far advanced is a large area in the neighborhood of the cable station, and there are a dozen quarters for officers of command rank that could compete with homes on Long Island, New York. Midway is coming of age.

But James' work is by no means without ruffles. Sometimes an unhorticulturally-minded Seabee will innocently undo a day's work with a single plunge of his bulldozer. Gooney birds, infants and parents, chew off grass blades for their haphazard nests. Mice strip the bark from trees to get water, and destroy fruits and vegetables. There are army worms in July. And all winter long the (Continued on page 442)

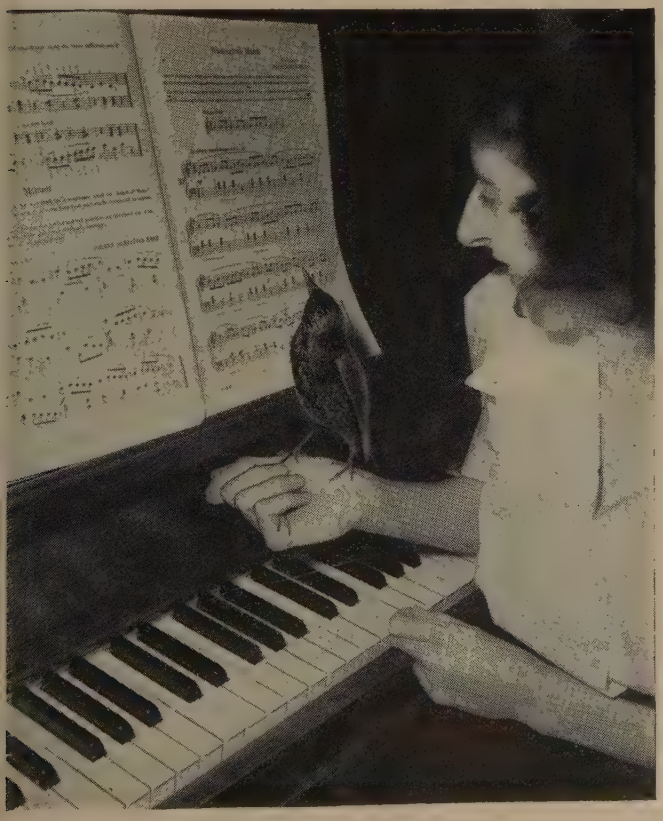
# A Talking Starling

*By* H. ROY IVOR

*Photographs courtesy of The Toronto Star*

"YOU'RE crazy!" To the ears of the startled guest, who had been stating his views with some force, the clear, little boy voice rang out like a protest. "Naughty to do it," came another reproof; then, to the amusement of those in the know, came "Sure you're pretty," as though to make up for the sudden rebuke. With unbelieving amazement the guest actually gaped—at a bird in a cage. To add to his bewilderment there poured forth, in a clear, sweet girlish whistle, the first three lines of "Home on the Range."

This gifted bird, one of our common and often despised starlings, had been brought home by Bob Henry of Bowmanville, Ontario, on his twelfth birthday. The nestling wore birthday clothes, for it was as naked as the day it was hatched. For Bob and his sisters, Betty and Margaret, the first problem was feeding the orphan. This fell to Betty because she loved birds, and she dug worms, cut them up with scissors, and, with tweezers, put them where they should go.

Dun-colored feathers soon came, and Betty felt sure her bird was a thrush. What a disappointment it was when someone told her it was merely a starling! But he had become a lovable pet, and the glossy green and purple lights on his new crop of feathers made up for his reputation.

Birdee aspires to no operatic career, but whistles the first few bars of "Home on the Range" in a clear and girlish whistle. Starlings are notable mimics and are known to be able to imitate many bird songs.

Betty Henry of Bowmanville, Ontario, Canada, and the talking starling, Birdee. Raised by hand from a naked orphan, the bird acquired its vocabulary by listening, then surprising his foster parents.

Named Birdee, the starling was petted and talked to with all the endearing phrases young people address to their pets. That he ever would learn to repeat these caressing words never entered their heads. Almost a year and a half passed, and, unknown to the Henrys, Nature's secret forces were at work in that little head. One day Birdee rewarded his friends for their love and care. Betty's mother nearly collapsed when she heard from the cage, "Come on, Birdee."

With growing amazement the children listened to the flow of starling notes, for here and there a word emerged. Then came a phrase as the bird continued to learn. Strangely, the uttering of the first phrases tired the little fellow, and long sleep would claim him. As he learned he became accustomed to this new way of expressing himself.

When Birdee first began to talk his words were not clear or readily understood. And, unless the young folks were close to his cage, he did not take in what was being said to him. As he progressed in his learn-

ing, both words and phrases became so distinct that strangers quite readily understood what he said. Little effort was made by Betty to teach him to talk, for, early, she learned that he distinguished between the tones of her voice when she tried to teach him and the tones of casual conversation. He learned from such talks and just was not going to be forced. Perhaps he is a very wise bird, for a feigned cough will not fool him, but a genuine cough!—that is different. Necessarily, however, many of the phrases he had heard many times, such as "Come on Birdee, sing up. Whistle." Most had been learned a word at a time; later various words had been joined together, and, strangely, were joined to make sense.

Some of his phrases are of considerable length, such as "Oh, you're a cute little Birdee." Oddly enough, too, many seem to be uttered on appropriate occasions. In his cage near the door he can see birds on the lawn. At times one comes near, and he calls, "Naughty, come on into your cage." When the dog enters the room where he is, he seems to know the dog should not be there and calls, "Go on out," or "Go on out here." But if the dog is scolded for coming in, he says, "Naughty to do it." What goes on in the head of this little bird as he pulls at the window curtain, saying "Naughty, naughty," over and over again? Often he has been told he is "naughty" when the curtain is used for a plaything, but how strange the association of ideas!

One day Betty and her mother were reading. All was quiet, not a sound in the room. Suddenly the quiet was shattered as the starling shrieked, "Birdee." His call was so shrill that they ran to his cage, asking, "What do you want, Birdee?" "Bread," he answered at the top of his voice. Sure enough, a glance into the food-cup showed it was empty. Not always, of course, do his answers fit so nicely as this, yet, to the continued astonishment of all who hear him, a great many of them do. Nor does he always join them together in the way he has heard them. Thus the command, "Go to sleep, Birdee," he changes to "Go to sleep, please." Yet he may answer with a snappy, "No, no, no."

Like so many gifted artists, Birdee is temperamental. When Betty or Margaret are particularly anxious to show him off to some visitor, he will not say a word. But no sooner has the visitor departed than the flow is turned on. Too, should Betty's mother talk to him he becomes quiet; crowds as close to the wire of his cage as he can, and listens. But if Betty approaches his cage he tells her all that he knows.

Perhaps it is not so odd as it seems that this bird has learned to talk, for it is well known that the starlings are splendid mimics. In the wild they have been known to imitate the calls and songs of some thirty native birds. However, of the many species of starlings, one, the hill mynah of India and southeast Asia, is considered the king of all talking birds, with the possible exception of the African gray parrot. Perhaps Birdee Henry will equal any of them.

★

# The Neighbor's Pet Crow Comes to Tea

*By* MARION DOYLE

Knock-kneed, he walked across the floor,
  Flagrantly sardonic,
Resembling an aged ambassador
  From a world demonic.

With ancient evil in his eye,
  He stepped with grave precision,
Observing us; with one hoarse cry
  Announced his amiable derision.

He helped himself, like a cavalier,
  To cakes and scuppernongs;
Then, eyeing his hostess with a leer,
  Flew off—with the sugar tongs.

CARPENTER ANT

*This is the thirty-sixth in Nature Magazine's series of educational inserts.*

# Household Enemies on the Home Front

By E. LAURENCE PALMER

CRICKET

EARWIG

SILVERFISH

BUFFALO BUG LARVA

HOUSE CENTIPEDE

BUFFALO BUG

BED-BUG

During the past few years we have come to think of many things in terms of war, and the mechanics of warfare. New words have found their way into our vocabularies—home front, blitz, foxhole, booby trap and others—and we use many to describe things and events in everyday life. Many of these words will pass on into the dictionary and out of our speech, but for the moment they apply most aptly to a home front battle that we have long waged, and will continue to wage—the war against household enemies.

There are hosts of pests that destroy things that are valuable to us. We do not propose here to consider such destroyers as rust, molds, fire, water or rats. Instead, we will confine ourselves to *some* of the smaller animals that are not ordinarily well understood, even though they may live, now and then, in the best of homes. Cockroaches, bed-bugs, fleas, head-lice, itch-mites, mosquitoes, flies and the like manage to make most people uncomfortable at some time during even the best-ordered lives. Clothes-moths, ants, carpet beetles, silverfish and larder beetles demand that we be constantly on guard. When the grocer delivers an order, or when we ride in a public coach or mingle in a crowd, we face the likelihood of providing a new grazing ground for some invertebrate pest. But what can we do about holding this home front from invasion by these hordes of enemies?

When we read of war, we learn of barbed wire entanglements, of flame throwers, of pillboxes. We hear of soldiers on both sides dying from thirst, from suffocation, from heat and from cold. We hear of drownings, of poisoned wells, and even of poisoned food and poison gases. All of these are weapons that we use without the slightest hesitation in our war against household pests.

*Barriers.* Man has always erected barriers to protect himself from some of his enemies. If you can keep the other fellow far enough away, the chances are he can do you little harm. And so, in fighting household pests, a part of the game is to know how to erect suitable barriers. Screens on the windows, double screened doors, tin-can containers for stored furs, tight trunks, cupboards and closets for storing clothing are the commoner barriers we use. To keep ants and bed-bugs from climbing on our beds, we stand the legs and casters in small cups of water, or of oil, across which these enemies cannot pass. To keep termites away, we see to it that, even though they may get into our houses, they cannot maintain a line of communication with their division headquarters. So we use concrete foundations under our houses, in part to make a dry barrier between the moist earth and the dry house, and hope that termites may not be able to bridge this barrier.

One of the more successful barriers used for keeping ants from reaching certain places is the barrier made by soaking ordinary cloth tape in a concentrated solution of corrosive sublimate. Such bands, properly placed, are most effective.

*Repellents.* Early human warfare consisted largely of devices to scare away the enemy. Masks, yells, and warpaint were designed to fill the enemy with fear so that he would abandon his plan to attack as promptly as possible. Only occasionally do we find this technique working in modern human warfare. In the fight against the invertebrates at home, we have an enemy without imagination, and, therefore, probably free from fear in the sense we know it. We must then use as repellents things that are positively offensive to what senses they may have. Sometimes, it seems that we assume that a thing that is distasteful to our sense of smell must be equally displeasing to a mosquito. Citronella, the commoner mange cures, and a host of other smelly things may serve as slight deterrents to indifferent mosquitoes, but it is doubtful if they do much to stop a determined attacker of the mosquito clan. Certainly it is better to put one's

trust in nets, screens and poison sprays than in any ill-smelling concoction designed to make your body seem too undesirable as a lunch counter.

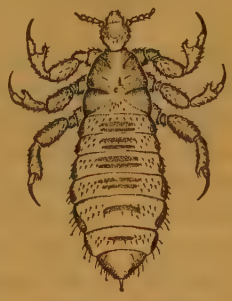
*Fatal Temperatures.* Thousands of soldiers and sailors have died in recent years because of the excessively hot or cold weather they have been compelled to face. We might take a lesson from this in fighting some of our enemies on the home front. We know, for example, that clothes moth larvae remain inactive, and therefore harmless to our clothing, if the temperature is kept down to 40° F. We know that repeated freezing temperatures will kill off many bed-bugs, cockroaches and fleas. Were it not for this, it is possible that the populations of some of these animals might reach such proportions that we could not compete with them. Unfortunately, we cannot afford to let our homes be frozen for any considerable length of time. As a result, we provide a comfortable place for the unwanted insect pests to survive a difficult season.

We know that a temperature of 120° to 128° F., maintained for from six to eleven minutes, will kill off clothes-moths, and wise householders may sometimes use this information to destroy these creatures, which may have hidden as larvae, eggs or adults in some hidden crease in a fur or garment.

*Flame-Throwers.* We have all learned how flame-throwers are used to clear an enemy from a deep trench or pillbox. Flames are also useful in fighting our enemies at home. A garment so badly infested with clothes-moths that it must be useless, trash in which silverfish, cockroaches, fleas, or bed-bugs have hidden should be dumped into the flames. Even old lumber infested with carpenter ants is more useful for fuel than it could be for construction, if, in the conflagration, any considerable number of destructive pests are destroyed.

*Pillboxes and Poisons.* In speaking of the flame-throwers, we mentioned pillboxes. Real honest-to-goodness pillboxes made of cardboard, and only about an inch across, may be most effective in fighting the foe within our gates. They possibly can lead to the destruction of more living things than the concrete counterpart on an active warfront. Of course, in either case, the pillbox is designed to give protection to some animals, while leading to the destruction of others.

HOUSE FLY



HEAD LOUSE

TERMITE

FLEA

COCKROACH

To make a pillbox for use in fighting pests, take off the cover of any standard pillbox you find around the house. Smear the inside with warm paraffin, or waterproof it with vaseline. Cut a number of vertical slits halfway down the side and make openings large enough to admit an ant, silverfish, cockroach, or any other pest that can be destroyed by poisoned bait. Cut similar slits in the sides of the top so that they will match those in the sides of the bottom. Now, put whatever poison bait you decide to use in the bottom of the pillbox. Glue the top back into position and set your pillbox trap on the "front line" where your enemy is likely to be. Your enemy will enter the pillbox for his lunch, and, while he can get a meal, it is not likely that it will be easily accessible to your child, cat or dog.

Another "pillbox" trick used successfully in getting ants is the simple one of soaking an ordinary sponge in a sweetened liquid. When the ants have crowded into the sponge for the feast, the sponge, with all of its inhabitants, may be quickly thrown into boiling water. It can then be used again.

What baits should you use to feed your enemies? Any drug store will have many to offer you, and most of them will be reasonably satisfactory.

Among the commoner poisons used to fight these enemies are the old familiar arsenic, phosphorus, sodium fluoride and thallium sulfate. Corrosive sublimate is used on poisoned tape, as suggested earlier, and Paris green finds a place for itself, particularly in protecting some indoor plants from some pests.

Arsenic is used particularly in destroying silverfish, those enemies of the bindings of books. To one and three-fourths cupfuls of oatmeal, ground to flour, add one-half teaspoonful of granulated sugar and one-fourth teaspoonful of salt. This is what your enemy relishes, but you would be the loser and he the winner if you stopped there. To win your battle, you add one-fourth teaspoonful of white arsenic or sodium fluoride. This is thoroughly mixed and placed where it may be reached by your pest. Here is where your pillboxes may come into play, and of course there is no international law limiting the size of the box you use. If arsenic is used in preparing the bait, it is common to moisten the mixture to help make a thorough mix, and then drying and grinding the material afterwards. If sodium fluoride is used, it must not be moistened.

Phosphorous paste, such as is used for rats, is also used for cockroaches. This, too, requires precaution lest it be eaten by the wrong party. A common practice is to smear it on the inside of paper cylinders, the opening in which is just large enough to admit the animal to be poisoned.

Thallium sulfate is a jelly as it comes from the drug store. It is ideal for use in the pillbox set-up. If used outdoors for ants, the jelly is commonly placed rather deep in short two-inch sections of garden hose. These are placed near an ant hill that obviously is the home of some of the ant invaders of your home. The ants do the job of carrying the poison down to their headquarters, where their queen presides, thus dooming the colony to wholesale extermination.

Hellebore in a powdered form is a common poison used for destroying fly larvae in manure piles. One pound of hellebore is mixed with twenty gallons of water and allowed to stand for a day and night. This should be sufficient to treat twenty cubic feet of manure, if the manure is spread out and the hellebore sprinkled over it with a sprinkling pot.

From the United States Department of Agriculture, we learn of a poisoned sirup particularly useful in fighting ants. Ten pints of water are put in a clean vessel over a low fire. When it is blood warm, one adds seven grams of crystallized tartaric acid, nine grams of benzoate of soda, and then, slowly, twelve pounds of granulated sugar. The mixture is stirred regularly to assure a thorough mixture. It is brought slowly to a boil and then allowed to simmer for a half hour. Any water that may have been lost in the boiling is replaced so that the total is the same as when we started. Then, two pounds of strained honey are added before the mixture cools. Now, in a separate container, dissolve three-fourths ounce of sodium arsenate in a pint of hot water. When this is cooled, pour it into the sirup and mix the whole thing thoroughly.

The above sirup may be purchased at drug stores, but if any general campaign is necessary it may be better to make it yourself. A little of it smeared over the inside of a baking powder can—whose sides have been perforated with nail holes large enough to admit ants—will destroy many ants if the cans are moved about from place to place, either in the house or out.

It may sometimes be difficult to locate the nest of a colony of troublesome ants. One of the tricks used in solving this problem is to feed the ants cream of wheat, oat meal or some other light-colored food small enough for them to carry away in small pieces. They can then be observed more easily by watching the movements of their conspicuous loads.

A common house fly poison bait is made by adding a teaspoonful of 40% formaldehyde to a teacup filled with equal parts of milk and water sweetened with brown sugar. It is set about a fly-infested room and is most effective.

*Traps.* In warfare, we hear of dragon's teeth tank traps, of booby traps, and of wire prisoner compounds. Similar devices are used in warfare on the home front. Fly traps of many kinds are commonly used, and sometimes with considerable effect. In Hawaii, they set traps in which mosquitoes will lay their eggs, but from which the young will not develop to maturity. The sponge soaked in sirup, suggested earlier, may be considered a booby trap for those who enter it, and cockroach traps have been proposed by various authorities. Most of these merely confine a relatively few individuals and do not get at the source of the trouble. Fly paper spread on a table, or hung in spirals from the ceiling, and the electric trapping devices have the same short-coming. For a time, it looked as though we might be able to entice mosquitoes to their doom by duplicating their hum mechanically and bring them to their death, either by mechanical destruction or by electrocution, but this seems hardly practical. It is about like the old recipe for killing flies in which one was advised to hold the culprit on a block while you chopped its head off.

SCORPION

INDIAN MEAL MOTH

WEBBING CLOTHES MOTH

*CULEX* MOSQUITO AND WRIGGLER

*Gas Warfare.* We might say that World War II is fought on a higher ethical plane than was World War I, since gas warfare, as this is written, is not so common in practice. No doubt fear of reprisal has been a more effective deterrent than has ethics, but we are fighting a gas warfare even now when we consider the use made of DDT bombs in driving mosquitoes and other pests from the tents and barracks of our fighting men.

We hope that when the war is over the surplus grenades and bombs are not turned over to our children for playthings. They were not designed for that purpose. Similarly, it may be unwise to free for general use some of the effective gases and sprays we have found satisfactory in ridding puptents of marauding malaria-carrying mosquitoes. We can have too much of a good thing and any gas or spray that will kill all or most insects is potentially dangerous to the thousands of useful invertebrates that are essention to the production of many of our food supplies, and that serve as natural checks on many of our enemies. If these natural checks are destroyed, we will only be making ourselves more work than less by wholesale destruction of all insects in the vicinity.

The commoner gases and sprays used in fighting insects and their kin would include hydrocyanic gas, carbon disulfide, carbon tetrachloride, kerosene, turpentine, oil-pyrethrum spray, paradichlorobenzene, naphthalene and ethylene dichloride mixed with carbon tetrachloride. Some of these gases and sprays kill by contact, and some kill primarily by suffocation. Some, like the gas produced by "moth-balls," lasts a relatively short time and leaves no permanent odor. Others are not dispelled so quickly. Some are so dangerous that they should be used most intelligently. Hydrocyanic gas, most effective in destroying bed-bugs, clothes-moths and most other insects, is no respecter of persons and may kill the house owner and his pets as well. In the larger cities, there are companies that can use such gases safely and well, and it may be best to call on them when the need arises rather than expose the household or neighbors to possible danger. Carbon disul- (Continued on page 424)

| COMMON NAME<br>SCIENTIFIC NAME | SCORPION<br>*Centrurus* sp: | HOUSE CENTIPEDE<br>*Scutigera forceps* | SILVERFISH<br>*Lepisma saccharina* | AMERICAN COCKROACH<br>*Periplaneta americana* |
|---|---|---|---|---|
| DESCRIPTION | Members of this order have a long, segmented "post-abdomen," usually. In the family, there is usually a spine under the "stinger" at the end of the post-abdomen. Length of species shown: about 3 inches. A pair of claws in front helps hold food; flexible "tail" brings stinger into play when needed. Some species are reddish; some, yellow; and some, green. | Members of order Chilopoda have reproductive pore near rear end, while Diplopoda have it forward. Chilopods also have but one pair of legs to a segment, instead of two. This species has a body about an inch long which is light brown, with 3 dark, longitudinal stripes. Last pair of legs are nearly 2 inches long. | About 1/3 inch long. Glistening scaly, silvery white, with a yellowish tinge; with two conspicuous appendages in front and three behind. Active runners. Related fire-brat, *Thermobia domestica* is more dusky in appearance. Bodies of both: flattened from top to bottom, with abdomens long and tapering. No wings. Many-segmented abdomens. | Length: to 1½ inches; one of the larger cockroaches of central and southern United States. Wings: long, and well developed. Antennae: may reach beyond the end of the extended, hind legs. Brown; the wings being usually lighter in color than the body. |
| RANGE AND RELATIONSHIP | About 300 species, 25 of which are found in United States from North Dakota, west and southeast. Common in drier regions. Not common northeast of line from North Dakota to the Carolinas, but increasingly common to southwest. Found in open, in wooded areas, in buildings and elsewhere. Some tropical species are to 10 inches long. Order Scorpionida. Family Centruridae. | Common in United States from New England through central and western states but more common in south. Favors damp places, such as cellars. While members of this family have 15 pairs of legs, those in related family Geophilidae may have 173 pairs. Some 800 species of centipedes, among the largest being a tropical form 1 foot long. Order Chilopoda. Family Scutigeridae. | Silverfish are found on floors, tables and shelves, particularly where there is starched material such as clothing or books or glued areas. They favor dry areas and live where it would seem there was little available for food until the books begin to shed their bindings and labels and the clothing begins to show holes. Order Thysanura. Family Lepismatidae. | Among most primitive of insect groups, being abundant in Carboniferous. Widespread in United States, competes for disfavor with German cockroach or Croton-bug, *Blatella germanica,* which came into prominence in New York City when Croton Dam was built. Dark brown to black, oriental cockroach, *Blatta orientalis,* common in Europe and in eastern and So. U. S. Order Orthoptera. Family Blattidae. |
| REPRODUCTION | Male courts female, mates with her, and is commonly eaten by her after mating, if not before. No eggs laid, but are incubated in the enlarged female. Young to 60 may live week or more clinging to mother's back before leaving to maintain independent existence. Two adult scorpions rarely together unless mating or unless one is eating the other. | Reproductive pores are at rear. In Geophilidae, and Scolopendridae, young have all of their legs at time of birth; while in Lithobiidae and Scutigeridae, they have but 7 pairs at this stage in their development. Centipedes are not normally social animals. Species here considered is most delicate and difficult to collect whole. | As in the succeeding orders the young and adults resemble each other, differing chiefly in their size. Metamorphosis such as is common in the higher orders of insects is accompanied by much less pronounced changes. | Female lays reddish brown discs of eggs numbering between 200 and 300. Eggs are stuck to floors and cracks, and in good temperatures hatch in about 70 days into young cockroaches that resemble their parents except that they have shorter wings. It may take a year in this species for development from egg to adult but other species have a shorter cycle. |
| HABITS | Sting of no United States scorpion is known to be fatal to healthy human adults although it may cause vomiting, convulsions and death in children. Tropical species much more dangerous. Are not affected by own sting and so cannot commit suicide. Are active mostly at night, seeking shelter in shoes, clothing or crevices at dawn. | Food: largely insects such as cockroaches. These are captured and poisoned by poison forced through opening in the poison claws. These poison-bearing claws are special claws. It will kill many small animals but is not dangerously harmful to man, though it may be painful. Treat by bathing in ammonia solution; retard blood flow. | The food is either plant or animal material, although some authorities contend that only plant material is eaten. It probably varies with different kinds of Thysanura. Some species that live in dark places have lost their eyes. They also differ considerably in their requirements of temperature and humidity. | Food: any organic material, particularly food stuffs, book bindings, filth, or, in some cases, even the nails of human beings. Filth and partly digested foods are expelled onto good foods, spoiling them. Generally, cockroaches avoid light, favor moist areas, and are likely to thrive in large numbers of their kind. |
| ECONOMIC IMPORTANCE | Dangerous to man, but more so to insects many of which are dangerous to man. Prey is primarily insects and spiders which they catch, hold, paralyze and then eat. In scorpion country clothing should be shaken thoroughly before it is put on. | Some tropical species are dangerous but most temperate zone species are highly useful as insect destroyers. The small ¼-inch garden centipede may be a pest of asparagus and garden flowers. It can be controlled by winter flooding of field for 3 or 4 weeks, treating soil with weak bichloride of mercury, or fumigating soil with paradichlorobenzene. | These insects may cause serious damage to books, clothing, carpets, and to museum specimens, particularly if storage rooms are damp. Control is by poisons. Card baits are covered with a 3% to 5% powdered arsenic and starch paste and placed where the insects are known to be, or buhach powder is sprinkled in their haunts. | Serious enemies of food stuffs and destroyers of books, carpets, paper and sometimes of clothing. Because they may eat same foods as man, have been used as experimental animals in studying effects of different diets on development through many generations. Serve as scavengers. Control by fumigation, cleanliness, traps and powdered arsenic baits. |

| FIELD CRICKET<br>*Gryllus assimilis* | TERMITE<br>*Reticulitermes flavipes* | HEAD LOUSE<br>*Pediculus humanus* | BED-BUG<br>*Cimex lectularius* | EUROPEAN EARWIG<br>*Forficula auricularia* |
|---|---|---|---|---|
| Length overall: of these crickets, about an inch. Female (figured), with long, slender ovipositor, which is lacking in the male. The smaller brown cricket, *Nemobius,* is possibly more common. It is ⅜ inch long; brown, with three darker, abdominal stripes. | Social, colonial. Four castes. 1st. reproductive caste; both sexes winged, black or chestnut, functional eyes, with wings over half their length beyond end of body. 2nd. reproductive caste: both sexes, pale; eyes, partly pigmented; wings, short wing-buds. 3rd. reproductive caste: dirty white, blind, rarely mature sexually, workers. Soldiers: wingless, rarely lay eggs. | Anoplura are small, wingless insects with sucking mouth parts, with or without eyes, and with large abdomens, and small heads. Head Louse: to .1 inch long, male being 2/3 size of female. Pale gray, with blackish margins, Head Louse being browner, tougher and smaller than Body Louse. | Length: about 1/5 inch. Flat. Reddish-brown. Wingless, or with only wing-stubs showing even in adult stage. Possessed of an objectionable and strong odor. Antennae: 4-jointed. Beak: 3-pointed. All bedbugs are parasitic, but each kind is limited to few hosts. | This order of insects includes the earwigs. Adult insects have long, narrow bodies, chewing mouth parts, and pincer-like structures at rear of abdomen. Wings: may be absent or present. No pupal stage. Length: to 1½ inches. |
| Field crickets are found in dwellings, fields, pastures, gardens. The cricket-on-the-hearth, or house cricket, *Gryllus domesticus* is slender, pale yellow, with 3/5 inch body, and is native to Europe but has been established in America. Family includes also the mole crickets. Order Orthoptera. Family Gryllidae. | Mostly tropical, though some live in temperate regions. In United States live in hidden nests, usually in wood of buildings or furniture, though some may build in living trees. Some build covered ways from nests to food or other necessities. Some, in Africa, build mounds, 12 feet high. Order Isoptera. Family Termitidae. | Human lice, world-wide in distribution and found only on man, rarely on apes. In one of at least 5 families, the Pediculidae have eyes and live on man; the tubular headed Haematomyzidae of elephants; the short, spined Echinophtheriidae of marine mammals, and the blind Haematopinidae, of rodents and ungulates, being others. "Crab" is the pubic louse, *Pthirus pubis.* Order Anoplura. Family Pediculidae. | Found in houses or poultry houses, in cracks in walls, floors, furniture or in beds. American species, 4, north of Mexico, including this species parasitic on man, mice and poultry; *C. pilosellus,* a long-haired species on bats; *Haematosiphon inodorus,* a long-haired species on poultry; and *Aeciacus vicarius,* in swallows' nests. Order Hemiptera. Family Cimicidae. | European Earwig, a native of Europe, but established in many parts of America. In West Coast area, it feeds on fruits, flowers and vegetable material. This is also true in the South. Earwigs are less common in the East where they are of minor importance. Appeared in Rhode Island in 1912. Order Dermaptera. Family Forficulidae. |
| In late summer or fall, female lays several hundred eggs, singly or in masses, in holes in ground. Eggs hatch in fall or spring. Those hatching from eggs in July may mature by mid-August. Immature crickets resemble adults but lack the developed wings. There is no pupal stage. | 1st. reproductive caste sheds wings after mating flight and female acts as egg-laying queen. Should she die, her place taken by one or more 2nd. reproductive caste queens with small egg capacity, or, eggs may be laid by queens of 3rd. reproductive caste or even by female soldiers, or workers. Nymphs: cared for by workers. Colony defended by soldiers. | Female mates 24 to 36 hours after reaching maturity and frequently through adulthood, may lay to 300 eggs during month she lives, ceasing only a day or so before death; usually laying 10 eggs a day. Eggs, "nits," conspicuous on dark hair, hatch in 6 to 30 days into nymphs that reach maturity in about 18 days after about 3 molts. Nymphs resemble adults in general. | Female may lay to 200, white, oval eggs, bearing a rim, in batches of 6 to 50, in cracks and crevices. Eggs hatch in 6 to 10 days, and, after 5 molts, in about 69 days, with an average of 8.75 meals, the adult stage is reached. Completes cycle, in about 7 weeks, with about 4 annual generations, in warm houses. | Winters as adult or 1/20-inch eggs underground. By April, females appear guarding newly hatched nymphs for up to 4 weeks or abandoning them. May lay second batch of eggs in June. Nymphs reach maturity in 2 or more months. In late summer, adults congregate in great numbers, possibly as mating act. Males, with bowed end appendages. |
| Food: plant or animal matter, but mostly plants. Males begin singing by wing rubbing about June and continue through August, the purpose apparently being to defy other males. Chirps loudest when weather is brighest and warmest. Males will fight each other if confined, the chirp pitch rising. | Food: of our species, mostly wood and other plant material. Differentiation in members of castes comes early, and interpretation of what establishes an individual in one caste or another differs with authorities. Certainly, the early stages of the 3rd. reproductive castes and of the workers appear to be almost identical. | Food: blood of host, about 1 milligram per meal. Will starve in 3 days at normal temperatures of 86° F. or in 5 days at 75.2° but may survive week at lower temperatures. Dies in 5 minutes at 124.9° F.; in 10 to 30 minutes, at 121.1° F.; and in 45 to 60 minutes at 115° F. Eggs destroyed in 5 minutes at 128.3° F. | Food: the blood, preferably of man, but other animals may be used; but without food, starvation may come in a year. Bite is poisonous to many people, but not to others. Immunity may be developed. Known to transmit relapsing fever, plague, Kala-azar, and possibly leprosy by contaminated mouths. | Food: almost entirely plant material. Earwigs have the habit of hiding in any available crevice during the day and are then discovered in clothing, books, among dishes and elsewhere, much to the displeasure of human beings. May destroy aphids. |
| May destroy grass, clothing, food and other materials. May be controlled by baits, such as sliced potatoes poisoned with Paris green or partly opened jars containing sweetened vinegar. Another bait is made of 1 pound of Paris green or white arsenic, to 25 pounds of coarse bran, and 2 quarts of cheap, strong molasses. | Very destructive to wooden things in areas within the range, and great care must be taken to control establishment of colonies. May eat interior out of a wooden table, leaving it but thinnest shell that may collapse suddenly. Same treatment may be given wooden foundations of buildings. Wood in contact with earth must be protected from attack. | Bite, or presence may cause infection with *Rickettsia prowazeki,* the cause of typhus that killed 3000 in England in one year; with *Rickettsia quintana,* the cause of trench fever, and with *Spirochaeta recurrentis,* the cause of relapsing fever. Lice controlled by heating clothes, by washing with 2% carbolic acid, or kerosene, followed by soothing olive oil and warm water. | Control by sulphur fumigation, 1 pound for every 1000 cubic foot of space for 24 hours, by treating eggs and hiding places with kerosene, benzene and gasoline, or with 6% corrosive sublimate in water or by heating house to 120° F. for one hour, or below 32° F. for continuous 3 or 4 weeks. | Control where they destroy flowers, fruits or stored foods is by use of traps or poisoned baits. Commonly mixture is 16 pounds of stale bread to 1 pound of Paris green or arsenic, ground fine, mixed with water, and spread over regions where insects have been seen. A nicotine sulphate spray is common where insects infest fruit trees. |

| COMMON NAME<br>SCIENTIFIC NAME | BUFFALO BUG<br>*Anthrenus scrophulariae* | WEBBING CLOTHES MOTH<br>*Tineola bisselliella* | INDIAN MEAL MOTH<br>*Plodia interpunctella* | HOUSE FLY<br>*Musca domestica* |
|---|---|---|---|---|
| GENERAL DESCRIPTION | Length: about 1/7 inch. Attractive, black, white and red, with a black background, spotted and speckled with white, and a central red line down the back. Larvae: nearly ¼ inch long, clothed with long, brown hairs, those on the sides and under rear parts being the longest. | Wingspread: just over ½ inch. Fore wings: more yellowish than in the preceding, without spots or markings. Hind wings: paler. Head: reddish. There is considerable variation in size. | Wingspread: to ¾ inch. Wings, at rest, folded along the back, inner third of fore wings, olive or buff, with the outer portion, reddish-brown, with a coppery luster. Under wings, lighter and plainer. No conspicuous difference in the sexes as to size or coloration. | Length: about ⅜ inch. Bodies: blackish. Eyes: reddish brown. Wings: transparent. Mouth: suited for sucking. Male: with eyes nearer together than in the female; with brownish sides on the abdomen rather than gray all over. Active and almost too well known to need description. |
| RANGE AND RELATIONSHIP | Introduced into America about 1869 and many times since, it has become a serious pest. It is a native of the Old World where it was worst in museums but it is now established in America from coast to coast. Strange to say, it seems to be worse where established in America than in Europe. Order Coleoptera. Family Dermestidae. | Possibly the commonest of the Clothes Moths, particularly in the North, on a great variety of substances. Order Lepidoptera. Family Tineidae. | Found about feed bins and granaries particularly in the summer. Also found in food stores, in pantries, in raisins, meal and such products. Introduced from Holland about 1856, and rather generally established. About 300 species of meal moths in this subfamily with one useful as a destroyer of scale insects. Order Lepidoptera. Family Tineidae. | Found almost everywhere that man is found, being most abundant in the summer or warmer months and in regions where manure or decaying plant or animal matter is to be found; in other words, almost anywhere. Order Diptera. Family Muscidae. |
| REPRODUCTION | Wrinkled, white eggs are laid on clothing, feathers, furs, silks, carpets. These hatch in 2 to 3 weeks into grubs that reach 1/5 inch during which time the skin is shed 6 times and damage takes place. Pupae are formed within the last larval case and are smaller than the larvae. Adults appear in fall and winter. | Eggs: white, oval are tucked away among clothes, hatch in about 6 days, into worm-like larvae, that make no case but leave a web in the trail and may develop for nearly a year or less, with possibly 2 generations, one from May eggs and one from September eggs. Pupal stage: about 2 weeks, in a rough cocoon. | Eggs: about 350, laid by a single female, singly, or in groups, hatch in about 4 days, in warm weather, into crawling, cylindrical, sparsely haired caterpillars, the hairs being about as long as the body diameter. Head: small. Larval stage: 2 weeks or more. Pupae: 5/16-inch, brown, in food-covered cocoon, 7 to 10 days. Life cycle: 4 to 5 weeks. | Female lays to 600 eggs in clusters up to 125 at a time preferably in horse manure exposed to sunlight, from early summer through to frost. Eggs: hatch in 8 to 12 hours, in warm weather, or to 3 days when cool. Larva: whitish maggot reaches full development in about 5 days. Pupa: in the old larval skin, either where the larva developed or elsewhere; about 5 days duration. |
| HABITS | Food: of adults, pollen of flowers, such as spiraea; but of the larvae, it is usually materials valuable to man. Adults found in spring and winter on ceilings and windows attempting to escape to out-of-doors. Both adults and larvae tend to congregate at different places. | Food: of larvae, almost any organic material. Known definitely to eat other insects, but usually the food must be relatively dry and undisturbed for a long time. Shaking may injure the animals at some stages. | Food: largely stored foods including grain meals, prunes, currants, dried apples, beans, walnuts, pecans, dried peaches, plums, clover and other seeds, crackers, dried bread, flour and the like. Caterpillars can go forward or backward leaving silk trail behind. To 4 generations a year possible. | Food: of larva, almost any decaying plant or animal matter. The adult transfers filth freely from place to place by emptying stomach for a new meal. Since adults do not lay eggs until about 2 weeks after emerging, a life cycle is about 24 days and there may be 10 generations a year. |
| ECONOMIC IMPORTANCE | Control is by keeping adults from laying eggs on valuable property, by using wool baits from which adults may be destroyed, by use of sulphur fumigation and kerosene in cracks where larvae or adults may hide, and by destroying infected materials where this is possible. | Control necessary. Beat, expose thoroughly to sun and air, articles to be stored in summer, then seal in paper bags or in tight trunks. Better yet, fumigate the articles thoroughly in carbon disulphide for 2 days, then add abundant moth balls (naphthaline), a repellent. | Control necessary. Freezing temperature below zero continuously for 4 or 5 days kills insects or, severe cold followed by high temperatures is effective. Sacks of food may be sprayed with carbon disulphide or fumigation may be done, using 2 pounds of liquid carbon disulphide to each 1,000 cubic feet of space. | One female in April might have 5½ trillion descendants by September. Known to carry typhoid and probably diarrhoea, dysentery, cholera, and possibly tuberculosis. Control is by screening, use of traps and destruction of breeding places, as well as consistent swatting programs. |

| HOUSE MOSQUITO<br>*Culex pipiens* | MALARIA MOSQUITO<br>*Anopheles quadrimaculatus* | YELLOW-FEVER MOSQUITO<br>*Aedes aegypti* | DOG FLEA<br>*Ctenocephalus canis* | CARPENTER ANT<br>*Camponotus herculeanus pennsylvanicus* |
|---|---|---|---|---|
| Female: 1/6 inch long with wing slightly shorter; proboscis, slender, brown, dark at the tip; abdomen, black with a bluish to bronze reflection and held parallel to support when at rest; legs, long, slender, brown scaled, one pair curved upward when at rest. | Female to 1/5 inch long; antennae, almost black; abdomen, blackish with numerous, pale and black hairs, black scales forming distinct spots, no coppery spot at wing tip; legs, slender and black; abdomen held at an angle to support when at rest. One pair of legs stretched in same direction. | Female: length 1/6 inch, with wing slightly shorter; proboscis, slender, black; abdomen, black, with each segment, except the last, with a narrow row of white scales, with a row of small, silvery spots on each side; legs, black with white bands; wing-scales, brown. | Length: about .1 inch. Members of this genus have a shoulder cape (pronotal) comb that is directed backward and is missing in other common species. It also has a comb-like "moustache." This is lacking in many other species. | Workers: ¼ to ½ inch, of two kinds, a Major Worker, with a large head, and the smaller Minor Worker. Drone: about ½ inch. Queen: to nearly an inch with the wings attached. The unique variations here to other ants here considered, are the differences in the workers. |
| Found almost anywhere in northern United States east of the Mississippi and north of North Carolina with closely related species extending the range almost indefinitely. Commonest of course within a relatively near vicinity to large areas of stagnant water. Order Diptera. Family Culicinae. | Found from Mexico north through the Mississippi valley into Canada and east to the Atlantic but becoming rare in the northern part of range. Other related species are however fully as dangerous and extend range beyond that of this species. Order Diptera. Family Culicinae. | Found in areas not touched by frost throughout the tropical and subtropical world, most commonly about human habitations wherever water may remain stagnant. Rarely found far from human habitations. In summer, its range may be extended northward. Order Diptera. Family Culicinae. | There are 5 species in the genus most of which are found on the flesh-eating mammals. Dog flea attacks man about as readily as it does dogs and is very common in Middle Atlantic States. Cat flea has larger head than the dog flea. Both are originally European. Order Siphonoptera. Family Pulicidae. | Common in dry decaying trees and timbers, in old barns and houses particularly where the wood comes in direct contact with the soil. It favors shady woods and other shaded areas in contrast with many other ants' liking for exposed sunny areas. Order Hymenoptera. Family Formicinae. |
| Eggs: laid in rafts of 100 to 300, floating on the water, hatch in 1 to 5 days. Larva: a wriggler that in 1 to 2 weeks becomes a pupa and when at rest hangs at an angle from the water surface breathing through the rear. Pupa: active, more compact than the larva, more erect than that of *Anopheles*, lasts for a few days. | Eggs: laid singly, on the surface of the water, hatch 2 to 3 days later. Larva: resembles that of the house mosquito, but rests parallel to the water surface rather than at an angle; period lasts about 2 weeks. Pupal stage: 2 or 3 days, active, more chunky than that in *Culex*. A new generation every 3 weeks. Winters as adult. | Eggs: laid singly or in clusters, on or close to water, hatch in 10 hours to 3 days. Larva: hangs downward from water surface, when at rest growing for a week or 10 days before pupating. Pupal stage; lasts 2 or 3 days. About 12 days after adult has fed on blood of yellow fever patient, it can transmit disease to others and continue doing this for over a month. | Female lays 70 or more waxy, white eggs on dog or floor. These hatch in 2 to 16 days into whitish, wormlike, active bristly larvae that live 10 to 14 days in cracks and crevices before forming pupa in fine cocoon that remains dust-covered 7 to 10 days before freeing the adult. | Life history is essentially like that of the ants already considered. The contact of dry wood to soil provides an excellent variation for the ants to seek varying temperatures and humidity to meet the demands of the adults and of the queens and young. Colonies may remain long established and become of unusual size. |
| Food for larva: minute male adult, the blood of animals; of male adult, plant juices. This species is a troublesome pest. Can carry filariasis. It is active day or night but has rather definite climatic conditions it favors. Related salt marsh mosquito may go long distance from breeding area. | Female feeds on blood usually during twilight and early morning hours. Malaria of different types caused by protozoan *Plasmodium* of different species. As the protozoan breaks into new animals, the patient has chills; at intervals of 2 days, in tertian (commonest in N. America) type; of 3 days, in quartan type; at variable times, in aestivo-autumnal type. | Adults: fly by day, bite fiercely, but attack quietly, though sharp, high note can be heard; attacks from behind or beneath, crawling into clothing to reach suitable spot. Only species known to carry yellow fever; also dengue, filariasis and other tropical diseases. | A generation from egg to adult may require 14 to 37 days. Newly emerged adults may live several days without food. Males emerge before females and probably females cannot lay fertile eggs until after they have had a drink of warm blood. Adults have been known to live over a year. This flea can jump 7 inches high and a foot on the horizontal. | Food: largely wood probably, but usually the work is done in wood already decayed by some other organisms such as the fungi. Whether it is the fungus or the wood the ant eats is difficult to state, but many ants are fungus eaters and this ant may be exception in that group. Injury to houses caused by fungi and by termites often laid to this ant. |
| Control is essentially that of draining or oiling the breeding areas. Larvae and pupae cannot pierce oil film to breathe and die of strangulation. Screening houses, spraying possible hiding places, swatting, represent other means of control. Use of repellents like citronella and pennyroyal or of olive oil and tar soap sometimes effective. | Control is by destroying the breeding places, isolating diseased humans to prevent infection of mosquitoes that might infect other humans. Infection of new patient is not possible before 12 days after mosquito has bitten sick person. | Control is by destruction of breeding places and preventing insects from becoming carriers through infection by feeding on the blood of persons with the diseases they carry. Yellow fever is important in war and in peace. | Dog fleas are suspected of carrying bubonic plague and other diseases of man and are known to carry the dog tapeworm from dog to dog. It is unfortunate for man that he has these fleas as parasites in common with rats. Control is by cleanliness, by shaking dog beds frequently thus destroying the delicate pupae and by killing off all rats that might carry disease. | Control most effective by destroying queen and home colony. Workers that feed queen can carry poison to her. Suitable poison made by dissolving 125 grains of arsenate of soda in quart of water in which has been dissolved a pound of sugar with honey added. This is placed on pieces of sponge placed in ant runways. Most drug stores stock effective ant poisons. |

AT THE LEFT, *AEDES* MOSQUITO AND WRIGGLER; NEXT, *ANOPHELES* MOSQUITO AND WRIGGLER; UPPER RIGHT, MOSQUITOES AT WORK; TRANSFORMATION OF *ANOPHELES* MOSQUITO, AND, RIGHT, OF *CULEX* MOSQUITO.

(Continued from page 419) phide gas may explode from a small flame, such as gas-jet, matches, cigars, cigarets or even pipes.

The oil and pyrethrum sprays must come in direct contact with the insect one seeks to destroy, and so the game has been to get the pyrethrum on something that would diffuse widely over an area. Most of the original oil sprays had a tendency to settle towards the ground, leaving many areas untouched. The newer DDT is not subject to this weakness.

*Other Means of Attack.* There are many means recommended for "proofing" textiles against the attacks of insects. Some are sound and others are not. The best proof against such trouble is the use of materials that have no food value to the enemy. Many of the new commercial fibers offer us considerable hope in this direction. Fiberglass may be as attractive as wood or fur, and it can have no dietary appeal to a clothes-moth.

Sun and air are effective in destroying many of the vermin that lurk about us and about our homes. The good old-fashioned "airing" that our home folks gave their clothing before it was stored away took advantage of this fact.

Of course, in warfare physical violence plays an important part. It is nonetheless effective in fighting insects. You cannot kill the mosquito buzzing in your bedroom by spraying oil on its breeding place. A good healthy swat does the trick. Similarly, the shaking of clothing or of the bedding of pets destroys many pests at certain stages in their life history.

Drowning of mosquito wrigglers by using oil films on their breeding places, boiling of bed-bugs by pouring boiling water on contaminated beds and floor boards and other methods may be found elaborated in a rather rich literature on household pest control.

Just as there is danger that an international war may be lost by temporarily letting down our guard, so the fight at home may be prolonged, if not lost, by carelessness. One thing is certain. The enemies such as those discussed in the chart section of this insert are ready and willing not only to attack us on the home front, but from the rear, or any other angle we leave unguarded. This is a warfare in which we all must serve throughout our lives. It is one we must win, and which we know how to win. To do so, we must gather all our fighting equipment and be prepared to enter the fray.

# Bibliography

Among the texts of interest—in whole or in part—in connection with this insert are:

*Fieldbook of Insects* by F. E. Lutz, G. P. Putnam's Sons, New York, $3.50.

*Introducing Insects* by James G. Needham, Jaques Cattell Press, Lancaster, Pa., $1.50.

*Insect Pests* by Harvey and Hill, Chemical Publishing Company, Brooklyn, N. Y., $4.25.

*The Insect Menace* by L. O. Howard, Century, New York, $3.50.

*Manuel for the Study of Insects* by Comstock, Comstock, and Herrick, Comstock Publishing Company, Ithaca, New York, $4.00.

*Applied Entomology* by H. T. Fernald, McGraw-Hill Book Company, New York, $3.50.

*Insects Injurious to the Household and Annoying to Man* by Glenn W. Herrick, Macmillan, $3.00.

*Elementary Lessons on Insects* by James G. Needham, Charles C. Thomas, Springfield, Illinois, $2.00.

*Foibles of Insects and Men* by William Morton Wheeler, Alfred A. Knopf, Inc., New York, $5.50.

*Social Life Among the Insects* by William Morton Wheeler, Harcourt, Brace and Co., New York, $4.00.

Numerous pamphlets may be obtained at nominal prices from the Superintendent of Documents, Washington, D. C. Ask for Price List 41, sent free.

# The 1945 Waterfowl Season

USING Congress as a blind, the most selfish element among duck hunters levelled a gun at Dr. Ira N. Gabrielson, chief of the United States Fish and Wildlife Service. The figurative firearm was legislation to permit the use of live decoys in migratory waterfowl shooting, as well as other proposed laws that would throw into politics other details of the administration of our wildlife resources. This would be a procedure sending us back to the darker ages of conservation.

This device was timed by its congressional sponsors to reach its height when the waterfowl shooting regulations for 1945 were being prepared on the basis of evidence in the hands of specialists. These regulations are proclaimed by the President of the United States upon recommendations made by the Fish and Wildlife Service to the Secretary of the Interior. This method is provided under the terms of the Migratory Bird Treaty Act and the treaty agreements with Canada and Mexico.

Dr. Gabrielson did not scare. He and members of his staff appeared before committees of Congress to assert that this was not the time to liberalize the regulations in this way. He reported a decline in the number of waterfowl for the first time since that perilously low figure of 1934. This was an apparent falling off of 20,000,000 birds compared with the high figure of 140,000,000 reported in 1944. He cited an increase of 225,000 in duck stamps sold in 1944. He pointed out that only a small percentage of the duck hunters use live decoys, and that this would be legislation in favor of a comparative minority.

In a letter to Senator Elmer Thomas, Dr. Gabrielson pointed out that, in the event of the passage of this live decoy bill, there would be "only two courses for the Fish and Wildlife Service to follow then in recommending regulations . . . to impose additional restrictions on all duck hunters in all parts of the country in order to compensate for the increased kill which will result from this legislation, or to permit the waterfowl population to decline."

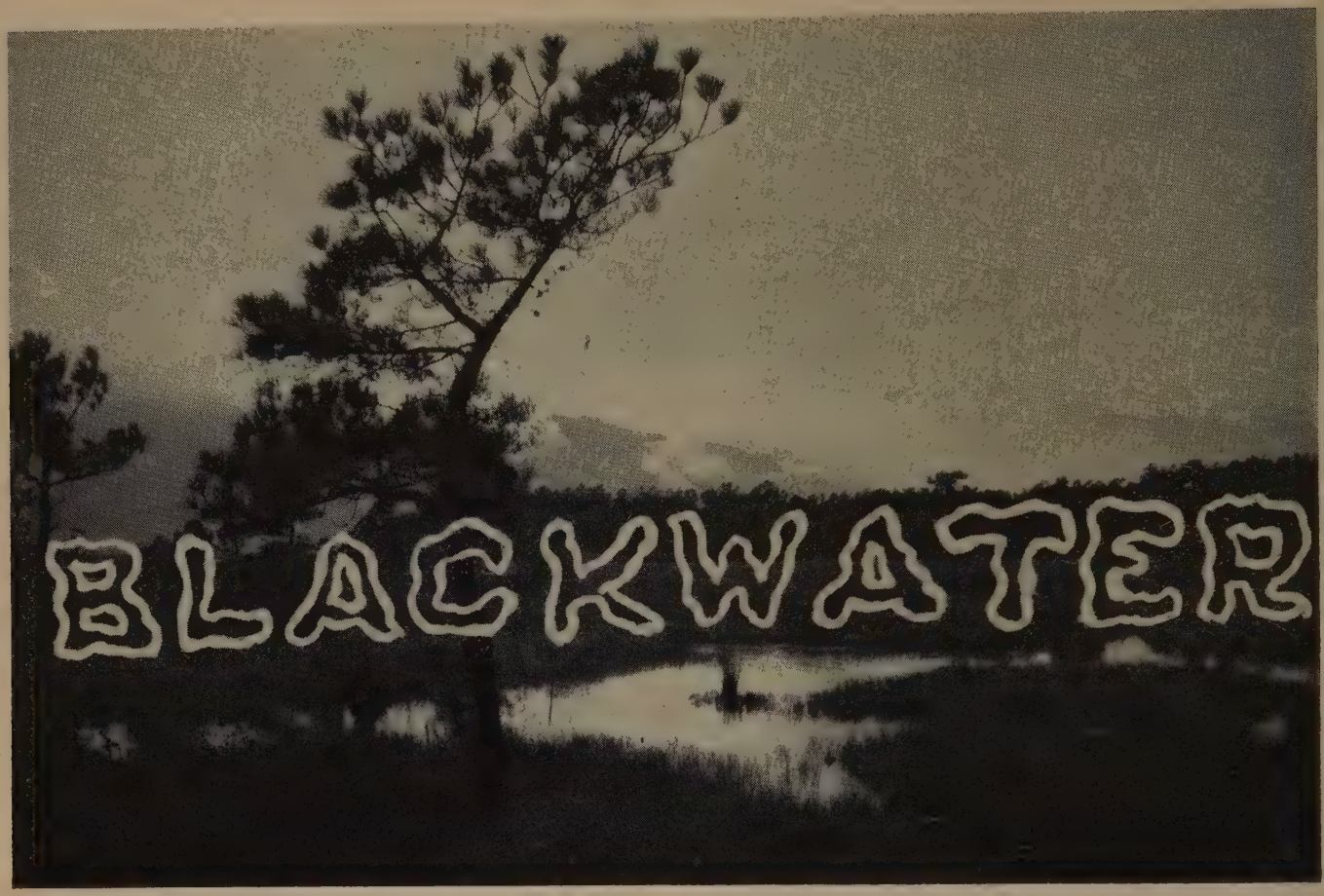
Nash Buckingham, chairman of the waterfowl committee of the Outdoor Writers Association, sees what we see in this move in Congress. In addition to the adverse factors cited by Dr. Gabrielson, this sportsman declares that "the bill means that almost instantly the entire structure of the Migratory Bird Law and Treaty Act may be embattled. In fact, this may be a first move by foes of conservation and sound, decent wildfowling to do exactly this." Never one to pull his punches, Nash Buckingham describes the proposal as "one sponsored by a few wealthy men too lazy to get out and hunt, and those commercialists who have but one thought in mind—to maul hell out of the ducks and profit by them."

We cite this unvarnished comment because these are the words of a sportsman—one who calls upon Senator Scott Lucas of Illinois, who introduced the bill, to withdraw it if he is "a patriotic American sportsman." Senator Lucas, of course, can hardly be described as a sincere friend of wildlife conservation, and in this instance he is representing the wishes—doubtless sympathetically—of the wealthy Illinois duck hunters, whose main goal seems always to make a shambles of the waterfowl migration on their part of the Mississippi flyway.

With man assisting Nature by providing greater protection and increased sanctuary, our ducks and geese have been built back to a fairly respectable figure. But the population is not yet at a figure that permits taking chances with this resource. The Fish and Wildlife Service has been under heavy pressure in various parts of the country for special regulations that would assure duck hunters of the best opportunity to get their daily ten birds.

In the face of these many and varied local pressures, and despite the threat of legislation, Dr. Gabrielson has managed to hold the line effectively through the regulations this year, keeping to an 80-day season for each zone and reducing the over-all bag to ten ducks. The migratory waterfowl still must fly a long and dangerous gauntlet from September 20 to January 20 as they pass through the various zones from north to south. Millions will fall to the barrage from the duck blinds; innumerable birds will be crippled and never recovered. Yet they cannot legally be shot through the use of live decoys, or over waters to which they have been lured by food put out to attract them to their destruction. Nor need they face many of the other slaughtering devices of earlier years, now, we trust, permanently outlawed.

However, the threat of legislation by Congress still remains. The decoy bill has been reported out of committee to the United States Senate. It *could* be passed by Congress and made effective with the current waterfowl shooting season. This is something that every lover of wildlife, every conservationist worthy of the name, and every sincere sportsman, should oppose. All such should let their Senators know how they feel about it, not only for the sake of the birds this season, but because such legislation is dangerous precedent.

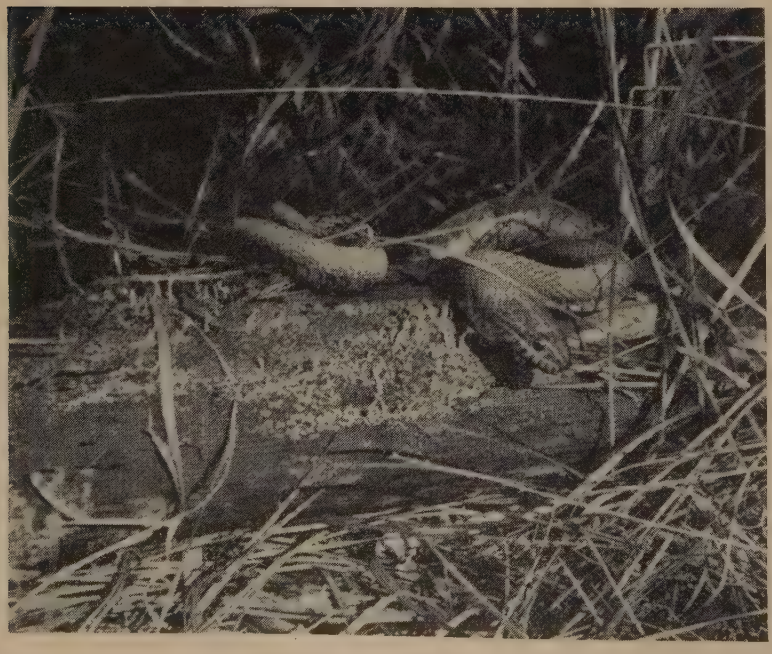



# A Story of the Marshlands

*By* ALLAN and ELLEN BONWILL

THIS is a true frontier, this wide marshland. It is a borderland between land and water, almost as primitive today as in the beginning of its known history. It takes its name, the Blackwater Marshes, from the winding Blackwater River, whose fresh waters flow slowly down from the hundreds of small swamp streams just north of this region. The water is clear, but dark as strong coffee, stained from its long contact with the leaf-clogged swampy areas where the river has its beginning. The river is a tidal stream, as are most of the others in the lower part of Dorchester County, down toward the southern end of the Eastern Shore of Maryland, but with a difference. This river is fresh—and so this marshland, where its fresh dark water first encounters and mingles with the incoming salt tides of the Chesapeake Bay, is partly a salt-water marsh, partly fresh-water—although there is no boundary between. Salt and fresh intermingle, modify each other, and struggle always to attain supremacy—although neither ever does so.

There is a definite sense of space on these marshes, like that felt on a seabeach, or on an open prairie. There are stretches



**A common water snake in Blackwater Marsh, going over a log on its way to a sunny spot for a siesta. Although photographed in January, when the snake is usually in hibernation, it was an unseasonably warm day.**

**An opossum curls up in a cosy nest of grasses, dry pine needles and leaves. They frequent the pine islands, and, if molested, put on a fine show of being dead until a chance to escape presents itself.**

here where one can look for a space of nine miles across level acres of marshland, to have the horizon bounded by the low-lying pine islands, with a bare elevation of two to three feet above water level. You look across acres upon acres of marsh, the great dome of the sky above, and around you only a few stretches of open water, and the miles of waving grasses reaching to the horizon.

It is a true marshland. Reeds and grasses are the dominant forms of plant life, while trees take precedence in a true swamp. The only trees to be found are those that grow on the tiny islands, and on the solid land bordering the marsh. No tree lives on the marsh itself.

Geologically, it is a changing land. Many forces are at work. The land itself, the Talbot terrace, part of the ancient region known as Appalachia, is slowly sinking. The islands of today, barely above the water level, are presumably the surviving tops of the ancient hills.

This slowly sinking land is continuously being overrun by the waters backed up by the tidal action of the salty Chesapeake Bay, tending to make the section a salt-marsh. The Blackwater River, however, with its tributaries, is continuously pouring out its slow flood of silt-bearing fresh water, which flows softly and gently down through and over this wide, water-covered section, slowly dropping its burden of fine mud and silt over the whole area. This silt is caught and held by the tangled roots and living vegetation of the marsh plants, which, with the silting-up action of the river, serve as important agencies in building up the land.

So, here are four forces—the sinking land, the salty bay-water, the silt-bearing river, and the soil-building plant life. These forces are waging a slow war among themselves, two trying to create an area of water, two trying to build more land.

However, there is still another struggle on the wide marshlands. This is the constant war for dominance between the salt water of the Bay, and the fresh water of the Blackwater River. Exceptionally high tides, and drought years—or periods of little rainfall —result in increased saltiness, all through the marshes, as additional water seeps in from the Bay. Heavy spring rains, or other periods of excessive rainfall, result in an extra amount of fresh water and silt coming down from the Blackwater. This, in turn, makes the marshes less salty.

This fluctuation in the amount of salt present in the water bears directly upon the plant life of the marshes. As the insurging salt tide meets the slow

**A muskrat feeding table. These little animals, which abound in the marsh, are most particular about their food, washing each morsel before eating. They usually take the food to some beaten-down tussock of marsh grass where they can feast.**

**The pine islands are surrounded, not by water but by the vast stretches of the marsh. Plants are arranged in zones as the lands become drier. Outlying are tussocks of three-square sedge, then salt grass, next low-lying bent grass, then tall, feathery *Panicum*, finally the tree association.**

seaward flow of the Blackwater, there is a struggle for supremacy. The stronger wins, naturally, and as the conqueror absorbs and mingles with the conquered, so neither side is ever wholly victor. This results in these wide areas of transitional marshlands—a scene of perpetual struggle, neither salt nor fresh, but verging in turn upon each.

Plants, naturally, have a difficult time, in this slow battle of land versus water, of salt water versus fresh. They must be ever alert to adapt themselves to the new condition, and woe unto the plant that cannot do so. There are many botanical casualties on the marshes.

Occasionally there are stretches of land dry enough in normal times to enable trees to live on them. But at times of high water, whether because of exceptional salt tides inflowing from the bay, or because of excessive fresh floods from the rivers, these areas become unfit habitat for tree life. This is the history of acres upon acres of loblolly pines, their dead trunks still standing, starkly black and white against the blue sky. Sometimes the water has taken the area permanently—at least as permanently as is possible in this constantly changing area. At other times one finds the pines, dead and rotten, but with green seedlings standing strong and healthy about their feet, seeded there posthumously by the pine cones, which have kept some seeds safe even though there was water enough over the land to kill the parent trees.

The kinds of plants range themselves like a great army; not an army of battle, but an army of settlers going into a new land. There are the pioneers, capable of enduring greater hardships than the others. These are the halophytic or salt-resistant plants, which take their place in the vanguard, and venture out into the saltier sections, nearer the deep water. From there back, the flora appears to be in regular borders along the water, changing from one kind to another as the water changes in depth, and as it changes in salt content.

There are definite zones of plants. Near the water's edge, and growing out into it along the marges, where the water depth is less than a foot, is the three-square sedge, *Scirpus olneyi*, the predominant member of this family in the Blackwater region. This section of the marshes will likely be a network of canals, or leads, and dotted with round grass houses, in the shallower sections, for it is the home and feeding ground of the muskrat. This plant, the three-square sedge, can stand a higher degree of salt than can most other plants associated with it, and it is one of the pioneers, venturing well out into the water. In drier areas, its close relative, *Scirpus americanus*, is found. Comparing these two sedges one finds both with the characteristic triangular stems, but the *olneyi* is always found in the wetter location, has a more deeply channelled stem, and bears its seeds close to the tip of the stalk. *Scirpus americanus*, however, is in the drier areas, and has an extension of the stalk past the seed-tip. Progressing toward the real salt marshes, nearer the Bay, one finds *Scirpus robustus*, a grassier relative, with tubers on the roots, and leaves around the stem. Its roots are less tender and succulent than the reddish ones of *S. olneyi*, so well liked by the muskrats of the Blackwater area.

Going from water toward land, one passes through areas where little grows except the *Distichlis*, or salt grass, and the *Spartina patens*, or marsh hay, also called small cord grass. This last is sometimes harvested for the farm animals (Continued on page 444)

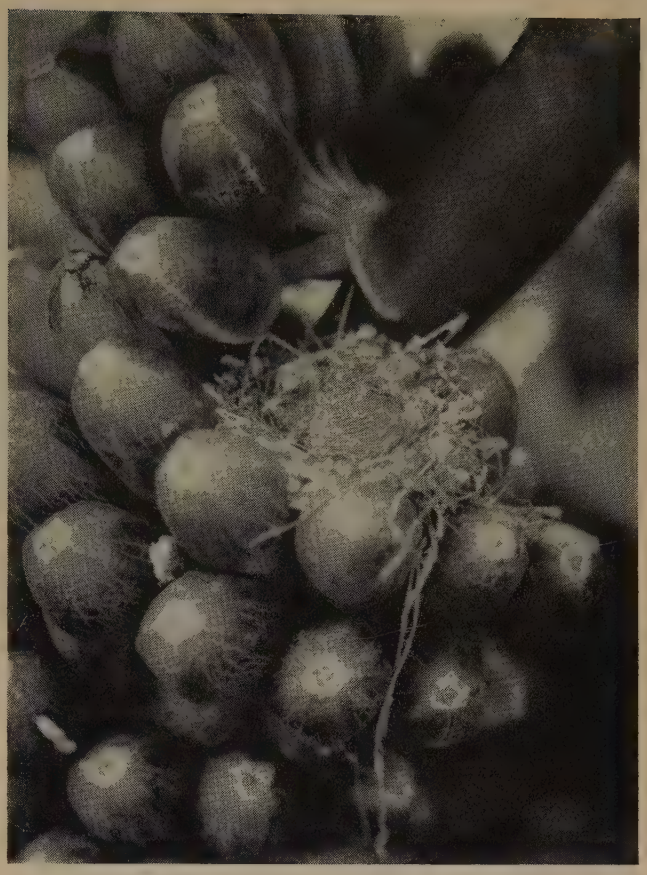
# Born and Bred on Bananas

*By* ALEXANDER F. SKUTCH

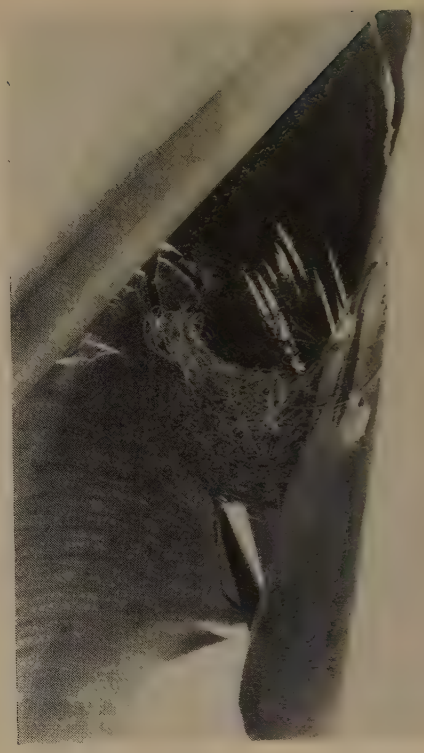
A FAMILY of young ruddy ground doves was hatched and reared in a frail, shallow nest of twiglets and straws, which their parents had built on top of a bunch of green bananas hanging from the "tree" in a plantation in Panama. Birds of numerous other kinds find a cluster of bananas, or of the related plantains, an attractive situation for their nests. Those that are somewhat larger build above one of the topmost "hands" of fruits, in a position similar to that chosen by the doves. Here I have found the bulky, mud-walled nests of Gray's thrush, *Turdus grayi,* and the big, roofed nests of the kiskadee, *Pitangus sulphuratus.* The upturned "fingers" provide a firm support and prevent the nest from slipping off. Birds no larger than a sparrow often hide away their little nests in the very center of the bunch, where they are so well concealed that they are rarely found unless one chances to see the owners enter or leave. In this position I have discovered nests of the blue tanager, *Thraupis cana,* the ornate little golden-masked tanager, *Tangara larvata,* the tiny black-and-white Hicks's seedeater, *Sporophila aurita,* and the tropical house wren, *Troglodytes musculus.*

In Costa Rica, a pair of blue tanagers built in the midst of a bunch of young bananas, entering and leaving the nest-space between two fingers of the same hand. As the fruits grew in thickness they reduced the width of the narrow passageway, and the female while incubating found it increasingly difficult to go in and out. One afternoon I watched her make six ineffectual attempts to force her way between the fruits and return to her eggs. I then brought a ladder and enlarged her doorway by separating the fingers, and she successfully reared her brood of two. Four days after these left the nest, the parents began a new nest, at which they worked during the intervals of feeding the fledglings of the first brood. They avoided a repetition of their difficulties with the narrow doorway by placing their second nest on the top of the same bunch of fruit instead of in its center.

In Guatemala, the big brown jays, *Psilorhinus mexicanus,* often build their bulky nests of sticks in the center of the rosette of great leaves of the banana, above the sharply down-bent stem that supports the hanging bunch of fruit. The golden-and-black Lesson's orioles, *Icterus prosthemelas,* piercing the tissues of the leaf with their sharp bills, pass strands of banana fibers or other similar material through the perforations, and suspend their neatly-woven cup beneath a broad green roof, which gives protection.



**Young ruddy ground doves, *Columbigallina rufipennis,* in their nest on a bunch of bananas on a plantation in Panama. A Gray's thrush sometimes supports her bulky nest on a bunch of bananas like those shown below. These are one of the numerous varieties of plantains, bananas of firmer texture, eaten after boiling, frying or baking.**



**The nest of Lesson's oriole is woven of fibers from the banana plant and suspended beneath a leaf by strands that the bird passes through perforations that she makes in the blade of the leaf.**

Although the tall banana plant offers attractive sites for birds' nests, it is by no means a safe location for their eggs and young. Whether for export, or for home consumption in the Tropics, the fruit is cut green, often before the young birds have flown. When cutting a bunch of bananas, I have sometimes inadvertently carried off a bird's nest, so well concealed in its midst that I found it too late. If the bunch be spared and it ripens before the nestlings take wing, its aroma will attract opossums, marmosas, raccoons, coatimundis, toucans and jays, any of which would relish eggs or tender nestlings to vary their meal of fruit.

★

# Start with Joe-Pye Weed

*By* EDWIN F. STEFFEK

ANYONE interested in the propagation of wild flowers as a means of preserving them for future generations might well start with Joe-Pye weed. It is an easy, attractive, and well-nigh foolproof plant. Then, as experience increases, one can graduate to the more difficult ones.

*Eupatorium purpureum*, as this plant is known to botanists, grows from three to ten feet in height, has a stout stem and fine, scallop-toothed leaves in whorls of three to six. The flowers are purplish-pink, slightly fragrant and come in large dense corymbs, or clusters, at the ends of the stem and principal branches in August and September.

This plant likes a slightly moist, rich soil, such as is found in low meadows, thickets and the banks of streams and ditches, but it will grow almost anywhere. It is especially suited for massing with sunflowers, heleniums, asters and tall-growing wildflowers, making it ideal for large-scale plantings in semi-wild gardens as well as in thoroughly natural settings.

It is perennial and very hardy. Propagation is readily accomplished by means of seeds, which are ripe from late September to early November. Particularly desirable forms may be propagated by cuttings of the growing wood, or by division in the spring. Seed may be sown in either spring or fall. Prepare the soil as for any other seeds and cover lightly. Soil acidity is not an important factor.

The common name goes back to an old Indian herb doctor of colonial days, and for many years the "Joe-Pye" weed was used as a remedy for various ills

In Nature it ranges from New Brunswick to Flor ida, and west to the prairie states, but can be grown elsewhere without much trouble by those interested

# "Raccy," the Mascot of Rattlesnake Shack

*By* A. B. CHAMPLAIN

PENNSYLVANIA GAME COMMISSION PHOTOGRAPH

She ambled down a main thoroughfare of the city, nonchalant and undisturbed by its bustle. Her air and attitude indicated familiarity with two-legged pedestrians, but she had four legs and was of the forest kind. She was minding her own business, but when a lady pedestrian of the two-legged kind looked her full in the face, the lady screamed. A crowd gathered; the police were summoned. They promptly sent for the zoo keeper and a game protector, who knew a raccoon when they saw it. They boxed up the sightseer, and the city went on with its routine ways.

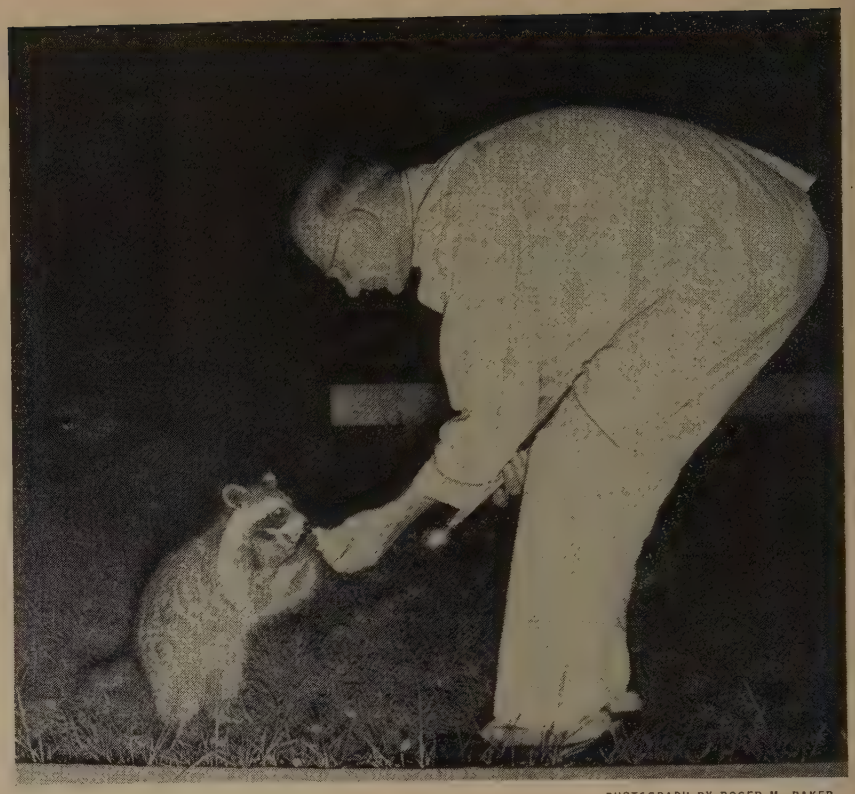
There was no raccoon shortage at the zoo, however, so it was decided that "Raccy" should be returned to the wildwood. The vicinity of Rattlesnake Shack, our camp on the side of Stoney Mountain in Dauphin County, Pennsylvania, was selected as an ideal spot for the animal's back to Nature venture.

Raccy inhaled the June mountain air; it seemed good, but it was difficult for her to realize that she was again a creature of the wild. She felt a little strange in her new freedom. She encircled the old shack, sniffed here and there at the building that held strange odors of wood smoke and perhaps the scent of mice and men. She drank from the cool, gurgling stream that danced from level to level on its way down the hill, and then made a practice climb up and down the old gum tree that stood in front of the shack. But for the time Raccy remained close inside the little clearing while her liberators watched. Finally they left, and Raccy prepared to follow them down the hill like an obedient house pet. She was puzzled when they tried persuasion to make her remain; then threats. They left her gazing enquiringly in the direction they had taken, and that was the last they saw of her for a long time.

Henceforth, Rattlesnake Shack was the center of Raccy's explorations. She wandered around the place until she became familiar with all its features. She investigated the trails leading in and out. She liked the clumps of plants and bushes behind which she could approach and retreat with the modesty befitting her retiring nature. Then she ventured into the encircling forest. Her objective was a home; a shelter to which, upon occasion, she could retire; a castle from which to sally forth upon the business of food and pleasure. She selected an old, hollow gum tree, quite some distance from the shack, just where we are not quite sure, as we must include a few conjectures along with the facts at our disposal. And this is where we weekend "pioneers" come in.

One morning in late June, after a sound sleep born of pure mountain air, we woke up and poked our noses out of the Shack door. There on the porch stood Raccy. Our experience in the past with local raccoons was a scurry and a flash, a fleeting glimpse in the early morning or dusk of evening. Here was a different story, and, from all indications, our guest was patiently waiting for her breakfast. We were surprised because we had not heard the story of Raccy at that time, but we were delighted. Raccy was friendly and companionable, ate from our hands and begged for more. After eating her fill, she entertained us. She played around like a tame kitten, running and jumping across the grassy clearing, poking her little hand-like claws into all the crevices and holes she could find, and generally expressing her pleasure in her new companionship. However, it was the last time for many months that Raccy appeared during the daylight hours. Henceforth, she reverted to the nocturnal habits of her kind.

Our round of weekend trips to camp held a new interest. The wood smoke from our fire, or the sound of our battery radio set, were signals for Raccy to drop in for a visit after dark. Before emerging from the dim recesses of the woods, she would examine the surroundings for a moment, apparently to glimpse



PHOTOGRAPH BY ROGER M. BAKER

**Raccy comes to Rattlesnake Shack for one of her nocturnal handouts. This photograph was taken during the second year of the raccoon's stay on Stoney Mountain.**

or scent other strange creatures. It was not long before she became monarch of the area and during several nights we heard the growling, muttering or squealing of Raccy or the other night prowlers she was kicking off the place. From now on, during her stay in the vicinity, it was only at rare intervals that skunks, opossums, or rabbits were glimpsed, while before these animals were our most frequent callers.

We found that Raccy enjoyed peanut butter bread, jelly bread and a cookie or two in preference to the dog biscuits that were offered, and, in return for these favors, she dragged up on the porch a small snake, a large salamander and some snails for our use.

Raccy's appearance at camp was usually about nine or ten o'clock at night. We would hear her as she hopped up on the squeaky porch, or see her little pointed face peering through the screen door. We would go out with gifts, and Raccy would be eagerly impatient for her food. She would stand on her hind feet and beg; climb up our legs, or even sit in our laps to enjoy dessert. She would clamber all over us, looking for a piece of candy, but we were not permitted to handle her. Except for this, she was generally docile and friendly.

Occasionally there were weekends when Raccy did not appear. She had thousands of acres of woodland to roam, hundreds of small bottom land runs to investigate, and Clarks Creek for aquatic interests. Sometimes she would arrive at camp in the deep night, when we were peacefully slumbering. She soon found a way of attracting our attention. The porch, supported by poles, supplied a means of reaching the roof of the building. With the agility of a squirrel, Raccy would get up there and thump about until we were awakened. The moment she heard our feet hit the floor of the shack, she was on her way down a post and ready for the plate of food we had reserved for her. We noted that crackers or dry food had to be dunked in the spring and softened before she ate them, but all of her food was not washed or wetted before eating. Frequent trips to the spring for water were characteristic, however, and the little stream was a popular site for her activities. We enjoyed watching her searching along the edges of the pool, standing in the water. She would thrust her little "hands" under the bank and bring them forth holding some unlucky snail, crayfish or salamander, which she delighted in playing with as a cat does a mouse before killing it.

Often, after refreshments, she would climb to the porch roof and curl up for a nap, or stretch out on a squirrel feeder nailed up on a tree. By morning she would be gone. At other times, after eating, Raccy would leave, to return another night.

This went on all summer, but by autumn we became worried. Soon the "coon" hunting season would be on. Men with dogs and guns, or fur hunters with traps would scour our mountainside and bottom lands. The nights would echo to the baying of hounds when these dogs gave the sly old native raccoons a run for their lives. So we knew Raccy would be among the first to fall into their clutches.

Finally, we decided on a course of action. With the cooperation of the game protector and the zoo keeper we made plans to remove Raccy from the woods. One weekend we carted a box trap out to camp. It was placed on the porch and baited with a few of Raccy's favorite cookies. After dark we heard her come up on the porch and then the slam of the trap door. Raccy became a guest at the zoo until the next spring.

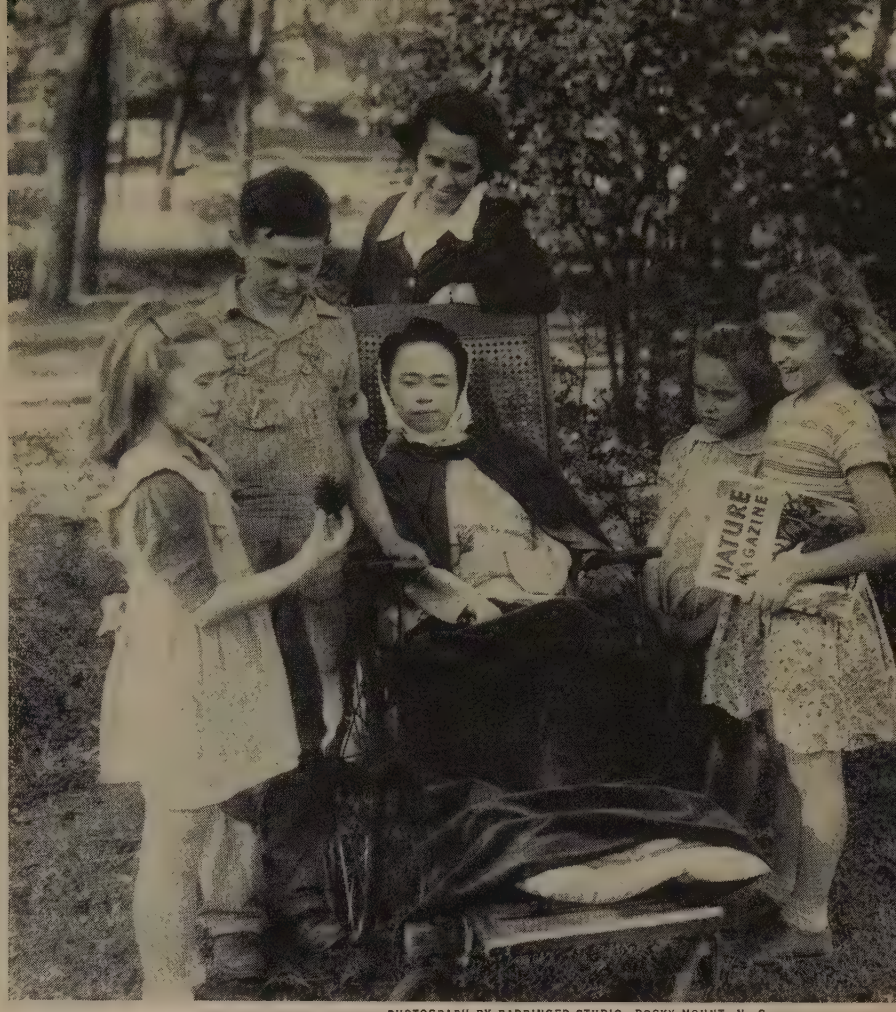
Again Raccy was taken to camp, and her experiences of the year before were almost duplicated. She had grown during this second year and really became the czar of the Shack area. She was the delight of our over-night visitors, who got up at all hours to see her as she rambled about the place and took food from our hands.

Toward fall, the time for running "coon" dogs came around again. One evening, in late September, Raccy arrived at camp about 7:30. We knew our friend Irvin Moyer would (Continued on page 442)

# Wheel Chair Naturalist Afield and at Work

*By* CHARLOTTE HILTON GREEN

And Nature spreads wide her book
In a temple fair and free,
To all who may listen she cries,
"Come, look!
Come and learn at my knee.
Watch the change in the finch's vest,
Note how the highhole carves his nest—
Come with light foot and loving breast,
And bury your ills with me!"




PHOTOGRAPH BY BARRINGER STUDIO, ROCKY MOUNT, N. C.

**Evelyn Hendricks and her friend and fellow naturalist, Hattie Turner, conduct an impromptu Nature class on pine cones.**

ALWAYS this verse by Dora Read Goodale brings to mind my little wheel chair naturalist friend, Evelyn Hendricks, who lives on a farm beyond Nashville, North Carolina. To a surprising extent she has buried at least some of her ills in "learning at Nature's knee," learning Nature by observing and studying in the outdoors, and writing and painting by herself.

Today naturalist, writer, artist; at thirteen, after two years of rural high school, she had to drop out because of a long illness that kept her in bed for several years and left her permanently and seriously crippled. In time she was able to be in a wheel chair, and she and a close friend, who came by after school two or three times a week to take her out, became outstanding young naturalists.

It was seven years ago that the editor of my paper sent me down to interview these two girls. At that time Evelyn had been an invalid for ten years; had been studying, reading, observing and keeping notes on her observations; notes on migration, bird-nesting, song-period, wild flowers. In the years since, I have kept in touch with her, watching her development, her reaching out to new, untried fields, her ever-widening range of interests and reading, her growing poise and self-confidence.

At that first interview she was so shy that she did not want to be written about, agreeing finally only on condition that I should use no names, simply feature the article as "Two Girls from Nash County." And here, perhaps, is a good place to say a word about the Damon and Pythias friendship that has lasted so long and meant so much to both.

Hattie Turner, now one of the state's outstanding teachers, had also had to drop out of school, to help work the farm after her father's death. When I first saw these girls, Hattie, after being out for ten years, had returned to high school and was planning on college, working her way through.

I accompanied them on one of those unique field trips, along country roads, over plowed fields, through pastures, along creek banks, up and down ravines, along the bogs, and to the savannas, those famed savannas that have such marvelous wild flowers, and are so little known! Tiny, elf-like Evelyn in the wheel chair, weighing but sixty-five pounds, was pushed by sturdy, dark-eyed, dark-haired Hattie—and I tagged along.

Hardly a flower, a bird's nest, a cocoon, a spider's egg-case, a half-hidden rosette, a small spleenwort fern, was missed by the alert bright eyes, those eyes that are constantly seeking, seeking for the secrets of the outdoors.

"Wait, stop, we just passed a cocoon in that clump of broomsedge," and sure enough, there it was! Or: "There is a myrtle warbler calling. Do you hear

him?" And again: "Hush, white-throat's whistle, far off!" And: "Look, that must be an orchid leaf. I wonder what the flower will be like. We'll come back later and see."

That same year I began what has become an annual part of my weekly column, "Out-of-Doors in Carolina,"—a Nature quiz, appearing on the last Sunday of the year and covering some of the wide range of things written about during the year. Answers come from all sorts of readers, including biology teachers and students. Yet the first three years Evelyn won with an almost perfect score—and did not look up any answers. After that, she had to be eliminated, but upon request she still sends in the answers, getting an "honorable mention" for an almost perfect score. Since then, Hattie, too, has won the award.

**Sweetbriar and Brer Rabbit intrigued the pen of the naturalist in the wheel chair.**

Evelyn is a natural student, her physical handicap (she is entirely helpless, able only to use her hands a little, but not enough to feed herself) seeming only to have sharpened her powers of observation and her keen, alert mind. A great reader, she can enter both spiritedly and interestingly into discussions ranging from religion to world affairs, and the world of books, which has become such a great part of her own world.

Even when she was in bed those long years and in great pain she followed some of the courses of her brothers in high school, even to studying French with them. Later, the University of North Carolina experimented with a course in French over the radio, and Evelyn took that, also!

Personally I was both pleased and proud to learn it was after her minister brother had given her one of my own books that she began making more careful observations and taking notes on them, notes zealously kept for many years. And out of them grew another idea. She decided she, too, would like to try writing an outdoor column and she did, for part of two years, "Time to Ramble," in the little county newspaper *The Nash County News*. In speaking about it, she pays tribute to its late editor, Constance Mathews, who encouraged her writing, making constructive criticism, suggestions and such. And remember, Evelyn had only had nine years schooling, all told!

Are those columns good? I think so. Here are a few excerpts:

"A stroll out under the stars on a summer night will remind one that not all the wild creatures go to sleep at dark. Every tree has its quota of chirping crickets and katydids. Lightning bugs reveal their presence by streaks of light against the dark woods. Up from the swamp comes the thrumming of bullfrogs. A rabbit scampers across the path and deep in the woods an owl hoots. The songbirds do go to sleep at dark, but often the mockingbird awakens to sing a short chorus in the moonlight." And another:

"A little tree frog, less than an inch long, was picked up from the grass. Its color was clear light green like the grass it had rested on. Placed on the trunk of a white oak tree the little frog moved over and fitted itself into a crack in the bark. Gradually its color changed to gray, a dark cloudy gray, which blended with the light gray of the bark. It was hard to detect the frog in its new environment. This changing of color is the tree frog's chief means of protection from its foes." Also:

"The friendliest, cheeriest little birds are the snowbirds. They seem to be everywhere, gathering in flocks to pick up grits before a snowfall, scattering into weed patches to eat seeds. They are dark gray in color, except underneath where they seem to have brushed against the snow and taken on some of its whiteness. Truly, they belong to winter, to frosty mornings and cold, gray days. When snow is falling and all is silent, we hear their cheery twitter, like the tinkling of tiny bells. In flight the little gray birds disclose white outer tail feathers, and when they dart into hiding in vines and cedar trees the white feathers seem to flash a 'so long' to all pursuers."

Evelyn has also won several contests in rural magazines; one on "This is My Hobby" in *The Southern Planter* and several on "Country Things I Love Most" in *The Progressive Farmer*. "I love the beauty of white herons," she wrote, "and the slow rhythmical beating of their long wings as they fly up from their nesting grounds along the coast to fish in our ponds; and the flowers that bloom in our meadows in July—sabbatia pinks with a star in each center, lovely white-fringed orchids, climbing boneset, handsome Joe Pye weed, comical monkey flowers, and other meadow beauties scattered far and wide."

Another of the girls' projects was the making of a

survey of the wild plant life of their community, roughly a mile by a mile and a half centering around Evelyn's home. By the end of the summer of 1943 they had identified more than five hundred species. In the beginning of her plant study Evelyn had identified them by pictures. Later, a Brazilian ministerial student, at college with her brother and interested in botany, visited him at home and showed Evelyn something about how to use a simple key. When he left for his own country he gave her his manual of the plants of North Carolina, as well as a book on insects.

Later, her discovery at a library (in the beginning of her plant study she did not even know what books there were on the subject) of Small's *Manual of the Southeastern Flora* opened a new world, making it possible for her to identify many plants she had been unable to place. By now she can pretty well tell at a glance to what family a flower belongs.

The scientific names of plants delighted her, also. "At first," she says, "I thought those names would be difficult, and botany be dull and dry, but once I got myself initiated into its study—again without a teacher—I found it exciting. Here was a complete new field of study in which I could branch out and make many discoveries. I got more excitement out of this botany manual than any book of fiction, nonfiction, biography or poetry that I read in 1943.

"Too, I learned to enjoy tracing the Latin and Greek origins of botanical names. *Aster* is the Greek name for star, *Viola* the Latin for violet. *Polypody*, the little evergreen fern that clings to tree trunks, gets its name from two Greek words meaning 'many feet.' The scientific name for arrowhead is *Sagittaria*, and that reminds me that a constellation in the night sky is called *Sagittarius*, the archer, and the little arrow he shoots across the heavens is *Sagitta*. It's a fascinating study."

Sometimes when she was alone, one of Evelyn's family would wheel her out to the edge of the orchard, or by a woodland path, or just out under the stars, and she would sit alone, for hours, listening to the calls and the songs of birds, until she now knows about all of those in her section.

Occasionally some of the neighborhood children went with the two girls on their rambles. Without hesitation they would help Hattie pick up the chair and lift Evelyn across small streams, over fences, under a bridge to see the phoebe's nest. Most of the seventeen orchids identified the two girls found together, but if Hattie found one, as she did the rare coral root on the hillside back of her own home, she did not bring it to Evelyn; instead she brought Evelyn to the rare coral root.

In fact, Evelyn has not included any of the plants in the list of five hundred until she herself had seen them growing in their own habitat, for, although she is interested mainly in taxonomy, she is also learning a great deal about plant ecology. As she says: "The charm of wild flower study, to me, is to find each flower growing in the place where it naturally belongs."

Always Evelyn's active and intense curiosity has kept her interested and fairly content. When, during the plant survey, she got curious about the many grasses she was finding, she got a good book on them at the library, and went to work. By now she has identified some forty species, which greatly interested Dr. H. L. Blomquist of the Botany Department of Duke University, who met Evelyn while she was "exploring" Duke's famed Herbarium during treatments at Duke Hospital. Dr. Blomquist remarked that he admired her courage, tackling the grasses. Not many people did. To which Evelyn replied: "It was not courage, merely curiosity. I just wanted to know them."

And that is how she came to take up sketching and painting, also in 1943. As she wrote me: "I had always thought it would be interesting to learn to draw *if* I had a teacher. But, art teachers do not grow in the wilds of Nash County. Finally, I realized that if I were going to learn to draw I would have to be my own teacher. So, I picked up my pen and went to drawing, with what results you can see from the sketches I am enclosing with this letter."

At first she made pen and ink sketches, then tried crayons. She did not even know about India ink until she was brought to spend a day with me last year and I had a local artist come out and give her a few pointers. Eventually, at the suggestion of an interested botanist-artist, who sent her paints and brushes, she tried water colors.

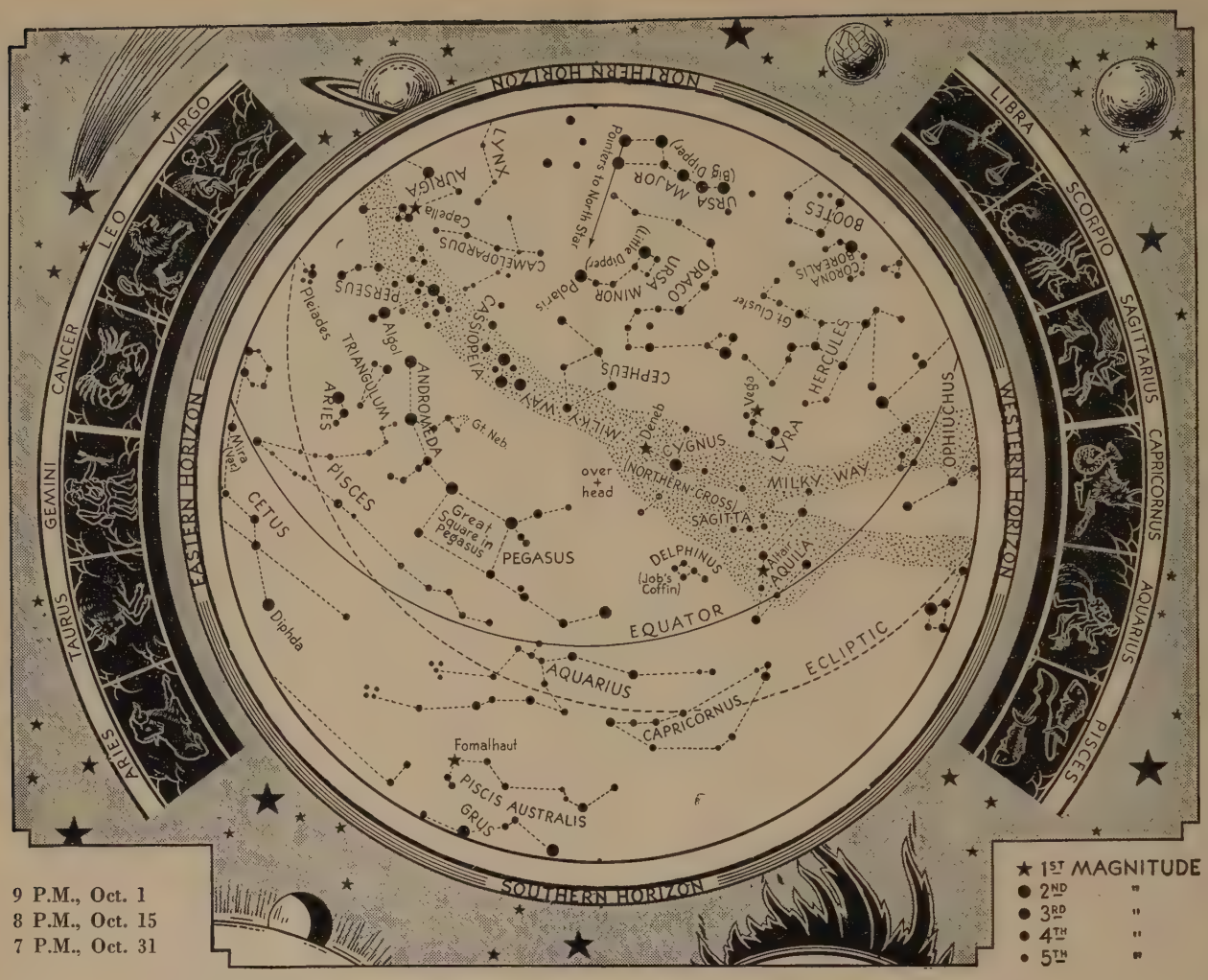
"I tried to make the sketches true to life, and accurate, rather than merely decorative," she wrote me. "It has been great fun, and also an excellent way to learn wild flowers, too, for in drawing them you have to give close attention to details of flower, leaf and stem."

She began teaching her- (Continued on page 445)

# Portrait of Indian Summer

*By* COSETTE MIDDLETON

So this is Indian summer! Shadows lie
Across the sleeping villages of corn;
A wedge of trumpeters design the sky,
And fences, bright with scarlet vine and thorn
March upward through the hills. Upon the gate,
Rotund and smooth in placid unconcern
Nestle the gourds, while pumpkins pose and wait
Where stubbled slopes are dark and creepers burn.
The bittersweet and Indian paint-brush splash
Brown grasses; thistly hills are purple mountains;
The willow and the sumac and the ash
Are bronze and red and yellow flaming fountains . . .
And here, a painted butterfly has come
To say goodbye to the chrysanthemum.




**To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time; add one hour for War Time.**

# Our Ancient Earth

*By* ISABEL M. LEWIS

In a paper entitled "On the Astronomical Dating of the Earth's Crust," Dr. Harlow Shapley, Director of the Harvard College Observatory, presents some interesting facts regarding the birth of our planet and its great antiquity. A comparison is made between the ages estimated for the oldest rocks in the earth's crust, as indicated by radioactivity, and the cosmic time table based on knowledge acquired from a study of stars, star-clusters and galaxies. Our earth appears to have been born somewhere around three thousand million years ago.

There is reason to suspect, according to Dr. Shapley, that three thousand million years ago was a momentous time in the history of cosmic changes. It was a time of "intense crowding of astronomical bodies when the millions of galaxies were closely packed together." This crowding of the galaxies was in the neighborhood of our own galaxy. At present the galaxies are receding from our galactic system and there is a tendency evident toward endless dispersion. The observed expansion of the universe, as this recession of the galaxies indicates, is at such a rate that, at a distance of a million light-years, a galaxy is receding one hundred miles a second; at a distance of five million light-years five hundred miles a second. There is no reason to believe that this rate of recession has been any different down through the ages. It means that about three thousand million years ago there was a crowding of these great stellar systems toward our own galactic system, while now the nearest of the great galaxies, the Great Andromeda Nebula, is at a comfortable distance of about one million light-years.

Dr. Shapley favors the theory of "chaotic origin" of the planets, at the birth-time of ordinary stars, as

the most satisfactory theory of planetary origin at present. It is assumed that whatever collision or explosion produced the sun, also produced, simultaneously, many fragments. The smallest of these would be mere meteoric masses, such as the meteorites that we know still hurtle through interplanetary space and occasionally reach the surface of our own planet, or that, according to the meteoric theory of the origin of the lunar crater, may have pelted our satellite in great numbers in past ages, before they had been mostly swept up by larger bodies. Meteorites are known to be of the same age as the earth's crust. It has long been considered that they may be of explosive or catastrophic origin. Most of the debris surrounding the primitive sun would have been lost or swept up by larger planetary bodies. The two largest planets of the solar system, Jupiter and Saturn, might have moved originally around the sun in the same direction and nearly the same plane, and gradually an orderly system of nine major planets and attendant satellites, and a more or less orderly debris of asteroids, comets, and meteorites would have evolved from the chaos of those catastrophic ages.

It is pointed out that the transition from hot, ionized, turbulent, gaseous, stellar matter in bodies of small mass, such as our planet, to a relatively cold crusted mass would be very rapid. As the geological evidence also indicates, the earth's crust is more than two thousand million years old. It is remarkable that during the several thousand million years that our sun and its retinue of satellites has been in existence no cataclysmic catastrophe has overtaken it. The intense heat and light from the sun's interior is screened off by a comparatively cool and dense atmosphere of temperature around six thousand degrees Centigrade. If this outer shell had suddenly been disrupted in some nova-like flare-up, the worlds encircling it, and dependent on it for any form of life existent on them, would have suddenly been exposed to sub-surface solar temperatures of the order of millions of degrees. All geological formations in the earth's crust and the surface crust of the earth itself would have been so transformed or so utterly destroyed that no evidence of its great antiquity, such as we read today, would have survived. It is clear that during the past two thousand million years and more, since the earth's crust was formed, our sun cannot have passed through a nova stage.

It is a remarkable fact about the stars, including our own sun, that although they lavishly radiate light and heat to interstellar space, with its temperature only slightly above absolute zero, they can continue to pour forth this radiation at an undiminished rate for thousands of millions of years. There are, of course, exceptions. Flare-ups and fadings do occur, but, for suns such as our own, steady, undiminished radiation continues for countless ages, sustained by release of sub-atomic energy within the sun itself.

Mother Earth, then, is probably several thousand million years old, and she has travelled far in her own orbit in our galactic system during all these aeons accompanying the sun as it moved onward through the galaxy. Celestial scenes have come and gone. Constellations have changed form. Old groupings of stars into fanciful configurations have changed to new as the sun and its family have journeyed onward. The sun has maintained through all this great interval of time a steady output of heat so uniform and unchanging that life has evolved and existed through the ages without catastrophic interruption through any celestial cataclysm. How long this may last, how many more ages the earth may continue to travel onward through space no one can say, nor whether its end, as its beginning, may be a catastrophic event.

# Celestial Change

*By* OREN ROOT BROWN

The night arrives like a spider
Weaving a soft dark web,
Snaring capricious little stars
With every well placed thread.

In this month of October there will be several conjunctions of the planets. Every planet except Uranus and Pluto will have at least one conjunction with another. Jupiter and Mercury will be in conjunction on October first, and both planets will then be very close to the sun. Jupiter will be in conjunction with the sun only a few hours before it is in conjunction with Mercury, and on the next day Mercury will be in conjunction with the sun. Mercury will not be favorably placed for observation this month. Jupiter passes to the morning sky after its conjunction with the sun. It will separate rapidly from it, and, by the end of the month, it will rise more than two hours before the sun and will be well above the southeastern horizon at sunrise. It will be in conjunction with Venus on October 30, and will be in the constellation of Virgo throughout the month.

Venus passes from Leo into Virgo this month. It is slowly drawing in toward the sun in the morning sky, and will rise about two and a half hours before it in October. It will be in conjunction with Neptune on October 24, and will then be very close to it. Neptune is visible only with the telescope, however, so the conjunction can be seen only telescopically. The conjunction with Jupiter will be interesting to observe as these two planets are the brightest in the sky, and Venus will pass only half a degree to the north of Jupiter.

Mars will be in quadrature and 90 degrees west of the sun on October 11, and will then be on the meridian at sunrise. It is in Gemini, passing a few degrees south of Castor and Pollux. It is easily recognized by its ruddy color, and is now increasing rapidly in brightness. By the end of (Continued on page 445)

# The School Page

*Edited by E. LAURENCE PALMER*

Professor of Rural Education, Cornell University
and Director of Nature Education, The American
Nature Association

## PESTS AND PETS

In the days of hellfire and brimstone, of witch doctors, hex artists, obeah fanatics, and bogeymen, of pixies, spooks, ghosts, and werewolves, we were accustomed to find people using fear of the unknown to make other people do certain things. Children were warned against wolves and bears. Darkest Africa was peopled with charging elephants, rapist gorillas, and roaring, charging lions. India oozed snakes. Fierce man-eating sharks roamed every warm sea of the globe in search of unfortunate sailors. Barnum cashed in on the people's satisfaction in seeing powerful beasts made impotent by confinement in steel cages. Zoos were popular largely because there people could not only feed the monkeys but could hear lions roar, could get the stench that comes from tigers and the gleam in a cobra's eye. The zoos were places where one went to see dangerous and interesting mammals, first, and if there were some crazy birds and slithering snakes and bored fish thrown in extra, that was just so much more profit to the patron.

It is quite possible that we were wrong in building up the importance of huge exotics. Few Americans will suffer from the attacks of elephants, even in the imminent future when we shall travel to the ends of the earth. Truly, we are in greater danger from the little invertebrates than we are from the mighty monsters with virile backbones. This change in viewpoint may account for the fact that the Bronx Zoo has recently discontinued the office of curator of mammals and education and initiated a position of curator of insects, although how this will change the fundamental appetites for thrills from the zoo-goers is hard for the writer to appreciate. Nevertheless, it is eminently sound educational philosophy to give people strength to meet intelligently the problems life is most likely to present to them. And while we may all enjoy reading about werewolves in the safety of our American homes, and may thrill at the musculature of a pacing tiger in a cage, there is every reason to believe that it is better that we put our brains to work learning how to outwit fleas that carry a variety of fevers, mosquitoes that are equally dangerous, ticks that will kill more Americans than all wild beasts together, and house flies, cockroaches, bedbugs, silverfish and similar pests that will force their attentions on us, whether we recognize them or not. It is because of this that the insert in this number of *Nature Magazine* has emphasized the study of invertebrate pests. Now what can teachers do about it all?

To the average teacher there will appear, of course, the suggestions that collections be made of the locally available invertebrate pests. Others will suggest "research" of the type that means the students hunt through assigned texts for answers that could be found by experimenting with the real live animals. Still others will propose series of drawings to be made, and lists made of "Farmer's Bulletins" that are to be had from the Federal Government. Still others will ask for exhaustive bibliographies and lists of available visual aids, and where colored pictures may be had free. It is not the philosophy of this page to encourage this sort of thing, when Nature study of the style advocated by Wilbur Jackman, a half century ago at Chicago, can be substituted. To those who must have references that can be substituted for the greater joy of original observation, we make no hesitation in calling your attention to a relatively new bulletin "Insects in Kansas," published by the Kansas Board of Agriculture, Topeka, Kansas. It is the sort of bulletin that is available to teachers only once or twice in a generation, and should be in every school library, east or west, north or south of Kansas. There one can, to be sure, quickly glimpse what others have learned about common invertebrate pests. There one can find pictures useful in identifying bizarre creatures that crawl about our homes, and can get some inkling of whether they are friends or foes. But all this is merely a step in making the most of the opportunity that presents itself when an intelligent, inquiring human being comes face to face with some diminutive, persistent, invertebrate creature that possesses habits and instincts that conflict with the interests of man.

I once knew a woman in college who went around with a small watch glass fastened to her wrist. Under the watch glass were confined certain louse parasites of the common hog. The lice were living successfully on the blood of the lady, but they had no privacy whatever and whatever they did was faithfully recorded by the human host, who not only gave her life's blood to the louse but took the louse's life history in return. I admit it is much easier for me to learn about what those lice did by reading the bulletin that lies beside me than for me to enter into some host parasite relationship with a live hog louse. But I still contend that the lady who gave blood got more rich experience than she could give to me by her writings. If I accept her experience as a vicarious substitute for the real thing I am just that much the loser.

I should not recommend that teachers ask their pupils to raise head lice, itch mites or hog lice on their hides for the benefit of the school. There are too many possibilities of the experiment going wrong, and the breeding stock making merry where they are not wanted. But I do contend that every school child should have the opportunity, at least once in his school experience, of watching what takes place in the life cycle of some common pest such as a mosquito, house fly or cockroach. Of these, the mosquito is possibly the simplest of all to observe, since all of its life stages are carried in a medium of relatively transparent water. No special inducement is needed to attract the initial breeding stock, and it may be confined in an ordinary tumbler of pond water, while a cheesecloth cover prevents the escape of the pestiferous adult. At ordinary room temperatures, the life cycle is relatively short and not unduly trying to the patience of the young investigator. If, for some reason or other, the initial attempt to get a first-hand life history recorded goes wrong, it is a simple matter to start over again with other breeding stock, and there is not the slightest need for depending on biological supply houses to provide the material with which to work. If any of my readers know where mosquitoes are not available for study at some time of the year, I am sure that the address would be welcomed by many readers of this page, and if such an address is provided I will be glad to pass it on to those who are interested.

Breeding cages for many common pests can be made most simply. The late Frank Lutz introduced me, years ago, to a little cage he had developed. It consisted of a strip of screen wire about an inch wide and 4½ inches long. This was folded to make a square an inch on a side with a half-inch overlap. The corners were bent to form sharp angles. Tops and bottoms were provided by cutting "tin" from tin cans and bending the edges to fit firmly over the open ends of the wire cage. The tin ends were held firmly in place by a rubber band. Many of these cages could be made in a relatively short time, and when it was desired that they be stored they could be easily collapsed and put away in a small space. Of course, larger

## To a Teacher

*By* ELINOR HENRY BROWN

It takes a microscope to show
Snowflakes vary infinitely.
Anyone with eyes should know
Children differ definitely!

cages could be made without difficulty, but the little cages were big enough to keep many small invertebrates alive as long as necessary. Any ingenious person can modify the device to suit specific needs of course.

In cages such as have been suggested one may easily experiment with common pests to see how they respond to various foods being available, how they increase or decrease their activities under varying conditions of light, heat and moisture, and how these activities may vary at different stages in the life history of the pest. Once a student has in his hands the facts that influence the prosperity of another living thing, he has the means of control, and he can make himself master of the situation. If a mosquito wriggler requires free air to breathe, we can control him by denying him that breath. If fleas and clothes moths, at certain stages in their life history, are destructive, we can control them by seeing to it that potential food supplies or nesting sites are given a vigorous shaking at sufficiently frequent intervals to prohibit a normal cycle being completed without disturbance.

The material in the chart section of the insert in this number of *Nature Magazine* will suggest to most teachers things that may be done to make real the study of the more disturbing of the local invertebrate pests. If this is not enough, "Insects in Kansas" will give further suggestions. If one wishes further guidance, any good entomology should help, and if that is not enough, then it is probable that additional suggestions would only lead to further requests for help, and this would deprive the teacher of the fun of solving the problem with the pupils.

## Bulletins Received

Space does not permit review of the many and varied bulletins in the field of natural history received. Listing, however, may serve to call them to the attention of readers particularly interested.

"The Fulgoroidea, or Lanternflies, of Trinidad and Adjacent Parts of South America." By R. G. Fennah. Vol. 95, No. 3184, of the proceedings of the United States National Museum. Issued by the Smithsonian Institution, U. S. National Museum, Washington, D. C.

"Checklist of the Coleopterous Insects of Mexico, Central America, the West Indies and South America. Part 3." Compiled by Richard E. Blackwelder. Bulletin 185 of the Smithsonian Institution, U. S. National Museum. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. $.45.

"The Ichneumon-flies of the Genus Cryptanura Brulle, Mainly Tropical American." By R. A. Cushman. Vol. 96, No. 3193, of the proceedings of the United States National Museum, issued by the Smithsonian Institution, Washington, D. C.

"50 Questions and Answers about Middle America." Published by the Middle America Information Bureau of the United Fruit Company, Box 93, Station Y, New York 21, New York.

"The Present Status of the American Eider on the Maine Coast," by Alfred O. Gross. No. 10 in the series of contributions from the Bowdoin Scientific Station, reprinted from *The Wilson Bulletin* and available from Bowdoin College, Brunswick, Maine.

"The Present Status of the Double-crested Cormorant on the Coast of Maine," by Alfred O. Gross. No. 12 in the series of contributions from the Bowdoin Scientific Station, reprinted from *The Auk* and available from Bowdoin College, Brunswick, Maine.

"The Laughing Gull on the Coast of Maine," by Alfred O. Gross. No. 14 in the series of contributions from the Bowdoin Scientific Station, reprinted from *Bird-Banding* and available from Bowdoin College, Brunswick, Maine.

"The Mammals of Minnesota," by Gustav Swanson, Thaddeus Surber and Thomas S. Roberts. Technical Bulletin No. 2 of the Minnesota Department of Conservation, Minneapolis, Minnesota.

"Handbook of Information on Entering Positions in Forestry," by Shirley W. Allen. Published by the Society of American Foresters, 825 Mills Building, Washington 6, D. C. $.25.

"The Natural History and Morphology of Amphiumae," by C. L. Baker. Reprinted from the report of the Reelfoot Lake Biological Station, No. IX, 1945, Reelfoot Lake, Tennessee.

"Cover," by E. Laurence Palmer. Volume 38, No. 4 of the series of Cornell Rural School Leaflets, discussing what cover protection means in the field of natural history. N. Y. State College of Agriculture, Ithaca, New York. $.25.

"Community Forests for Rural People." U. S. Department of Agriculture Leaflet No. 244. Available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Five cents.

"Timber and Game—Twin Crops," by Harold Titus. Discussion of interrelation of forests and wildlife production. Available from American Forest Products Industries, Inc., 1319 18th Street, N.W., Washington 6, D. C.

"Table Mountain Dam—A Public Liability." An adverse report on the proposed dam on the Sacramento River. Published by the Salmon Conservation League of California, which apparently has its headquarters in San Francisco although the pamphlet gives no adequate address.

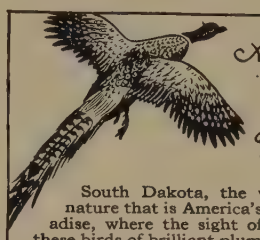
"Conservation—Up and Doing." A discussion of pressing conservation problems, and the annual report of The Emergency Conservation Committee, 767 Lexington Ave., New York 21, N. Y.

**Free Fall Catalog**

**Just Off the Press**

Showing Hunting Footwear, Clothing, and forty-three other leather and canvas specialties of our own manufacture for campers and hunters.

L. L. Bean, Inc.
Freeport 270, Me.



*Abounding in Nature's Treasures*

South Dakota, the wonderland of nature that is America's pheasant paradise, where the sight of thousands of these birds of brilliant plumage and graceful beauty will thrill you! . . . Abounding in scenic treasures—the weird Badlands, breathtaking Black Hills, mining towns of yesterday, trout streams, petrified forests—all hold a charm for the tourist in search of adventure! . . . No visit to South Dakota is complete without a pilgrimage to the Shrine of Democracy, where the heroic figures of the Empire Builders rise in sculpture from majestic Mt. Rushmore. Plan now for your "first" peacetime vacation in this land of cool summer nights and no mosquitoes. Write for new, colorful 32-page booklet.

**A. H. PANKOW,** *Publicity Director*
**South Dakota State Highway Commission**
**Pierre, South Dakota**

**CONSERVATIONIST WANTED**

Wanted, man as Director of Wild Life Department devoted to protection, conservation and education in general field of wild life. Furnish educational background, professional and personal references.

American Nature Association - Box 4, 1214 16th St., N.W., Washington 6, D. C.

**HOW TO SELL WHAT YOU WRITE**

Tells you where to sell fiction, radio scripts, and articles for magazines, trade papers and syndicates. Gives editors' needs and requirements. Also tips on how to write to sell. This magazine has helped new as well as established writers for 25 years.

**FREE** Write today for sample copy to Writers' Magazine
*6362 Hollywood Boulevard, Hollywood 28, Calif. Dept. MR105*

**WRITERS' Markets and Methods MAGAZINE**
Advice From Such as:
Ben Ames Williams
Vicki Baum
Erle Stanley Gardner
John Steinbeck
Kathleen Norris
20¢

**BOUNTY OF THE WAYSIDE**
The Xmas Gift for Nature Lovers

A 12-page calendar for 1946, with sketches in full color of 25 of Nature's edible gifts shown against backgrounds of New England coastal scenery. Recipes, and suggestions for finding, make this an invaluable guide to roadside foods.

With attractive cover in colors, packed in an Xmas-green box, it is sent postpaid to you for $1. Limited edition—order early. **NELSON COON—175 No. Beacon St., Watertown 72, Mass.**

**Learn to MOUNT BIRDS**
**Tan SKINS, Make Up FURS**

Be a Taxidermist. We teach you at Home. Mount Birds, Animals, Pets, Game Heads, Fish. Save your hunting trophies; decorate home and den. MAKE MONEY. Mount and Krome-tan for others. Big spare-time profits.

**FREE BOOK** 100 game pictures 48 pages. Hunters, get this wonderful book. It's Now Free. Send post card TODAY. State your AGE.
NORTHWEST SCHOOL of TAXIDERMY
Dept. 2947 Omaha, Nebraska

**FREE BOOK**

# PLANT DISEASES THAT HAVE MADE HISTORY

(Continued from page 408)

and Canadian wheat yield some 280,000,000 bushels. A British writer has pointed out that, "that loss was twelve times as great as the gain from the whole of the ploughing-up campaign in Great Britain during the [First World] war." In 1935, rust docked the grain crop of a dozen States almost 123,000,000 bushels.

Varieties of this wheat rust also attack barley, oats, and many grasses. One scientist has estimated that stem rust and other rusts damage the world's grain crops some three hundred million dollars annually. It might be safe to guess that stem rust has cost past and present generations more than all other direct plant-disease losses put together.

Stem rust "has made history" in a more purely scientific aspect. It was the first plant disease found to infect alternate hosts. In the world's tangled "web of life," many pests pass from a definite life stage in one living thing to another in another. The liver fluke travels from sheep to water snail, and from snail back to sheep again. Extermination of either man or mosquito would end the malarial parasite. Robigus of the Romans was a resourceful demon. Winds were his transport; clouds and mists were his shield. After ages solidly based in wheat stems rising from the Roman earth, he presently found still another means of making himself a nuisance. Had any votary of Robigus survived until the seventh or eighth century A. D. he might have made a case for revival of Rust-god worship. Then it was that Arabians brought the barberry from western Asia to southern Europe. Presently peasants began to notice that where the barberry throve, wheat failed. Frenchmen at Rouen began, in 1660, the first recorded barberry eradication campaign. About that time, Englishmen, who never had believed in Robigus, carried the barberry across the Atlantic to make American jams and preserves. Rueful colonists presently began to "make laws" about the barberry, but there were more scofflaws than law enforcers, and both barberry and wheat disease continued to spread. The diary of George Washington in 1768 recorded "experiments" on the wheat rust.

Through all those centuries of little microscopy, no one had determined what really caused rust. Persoon proved it to be a fungus in 1797. Nearly eighty years later, in one of the classical researches of botanical history, the German, De Bary, proved that spores borne on wheat in the autumn were harmless to wheat in the spring. They did, however, cause spots on barberry leaves, and from these the pest jumped quickly back to growing wheat.

Since then, millions of American dollars have been spent in barberry eradication. Digging out the barberry helps, but that alone does not save the wheat. Rust "jumps" to and from the barberry only briefly in the spring. Once the orange summer spores are formed, away dashes the disease across the wheat fields. If summer spores winter over, as they do in warm climates such as that of southern Europe or California, or if wind brings them, as it does from Mexico and Texas northward to the Dakotas and Canada, the pest can get along perfectly without the barberry.

Resistant varieties are the wheat farmer's best bet. We have some good ones, but rust resistance is a highly complicated matter, and so far no wheat variety quite ranks beside the Sebago potato.

While particular rusts generally stick to particular plants and plant sequences, Robigus reigns over a lot of rusts that take in many plants and a lot of territory. The pine blister rust, for example, came to us from Europe about forty years ago. In the short time since, it has sadly hampered Eastern reforestation with white pine, and its unstopped progress may eventually mean the commercial end of the still more valuable sugar pine of the Sierra and the western white pine that centers in Idaho. Here, Robigus does not ride the barberry; he uses instead the currants and gooseberries whose bird-scattered seeds spring up in millions of little open spaces in thousands of square miles of pine forests. There is no pine-to-pine transfer, so extermination of currants and gooseberries would finish the blister rust. But foresters and plant pathologists who have been painfully digging and poisoning the pestiferous scrubby berry bushes of the Sierra tell us ruefully: "Try and do it."

Most disastrous of single rust-wallops was the sudden body-blow that knocked out Ceylon's principal crop, coffee, in 1868. Later, rust practically destroyed coffee in India, badly damaged it in the Netherlands Indies, the Philippines, and some parts of Africa. Like many other rusts, this one centers its attack almost wholly on the leaves, which become spotted, then yellow-powdered with spores, and presently fall. A few seasons of that and there is no coffee. In managing the "leaf-disease," Robigus does not bother about berry bushes of any kind; spores simply blow and scatter from leaf to leaf and that is enough. Luckily for our morning cup, coffee seeds and seedlings transferred to the New World did not carry the disease. So the tree that yields the fragrant crop took over huge areas in southern Brazil and lesser territories in Colombia, Haiti and Puerto Rico. Brazilian economy has been based —rather too much so—on coffee. Had Robigus let East Indian coffee alone, the political and economic history of much of Latin America would have been far different. Naturally the utmost efforts have been made to keep the "leaf-disease" out of this hemisphere. In 1903, it is said, a shipment of diseased Oriental coffee plants reached Puerto Rico, but a vigilant botanist detected the rust, and a quick fire ended the menace.

If Pan-America escaped the coffee rust, our southern neighbors have plenty of other fungus troubles. War-time revival of "yes, we have no bananas," is partly due to shipping shortage, but also to two serious diseases of the banana plant —worsened in some areas by difficulties in getting fungicides. Introduction of the resistant Philippine abaca—a banana plant that yields hanks of rope rather than hands of fruit—has been a godsend both to our cordage needs and to Panamanian planters.

While coffee was shifting from the Old World to the New, South American cinchona and rubber were making the opposite trip. Plant disease seems to have played no great part in the history of the quinine tree, but Brazil's rubber, *Hevea,* has a leaf disease of no great moment among scattered trees in the forest, yet quite another matter in seed-beds and plantations where young foliage makes uninterrupted canopy. Henry Ford, who started on Brazilian rubber before Pearl Harbor, beats the game with the old resistant-variety stunt with a new angle. The highest-yielding rubbers have disease-sensitive foliage. Budded on seedling roots, these may be spray-protected long enough to form a shoot several feet in height. This trunk is then top-worked with a low-yielding variety with vigorous resistant foliage. The high-yielding stem takes the food the leaves send down, and, presto!, there is latex in plenty. In the future, science may find a full-length, high-yielding rubber. While the Brazilians are not exactly praying for it, there may be some day a coffee tree that will grow on "India's coral strand" without being drenched in copper sulphate spray to protect it.

Speaking of sprays and fungicidal dusts, war scarcities of copper and mercury have been no asset to the American farmer. When the war-time history of continental Europe is written, the story of fungicide scarcity may be overshadowed by more dramatic disasters of bombed cities and scorched earth, but it will nevertheless provide a chapter in an epic of starvation. Scientists there and here have devised some new fungicides, but nothing, apparently, with the blitz potentialities of D D T among insects. Hampered but not yet subdued, plant diseases will encumber reestablishment of shattered national economies and hinder the feeding of starved millions. Misbehaving fungi have made plenty of past history; it remains for the world's scientists, the plant breeders in particular, progressively to lessen their havoc in the difficult days to come.

# HARDY WILDFLOWERS and FERNS

**Good mature plants—for Rock Gardens, Borders, Bedding, Shady Nooks & Corner of the garden.**

## COLLECTION I

*Spring Flowering—Height 6 to 10 inches*

Asarum Canadensis—(Wild Ginger)
Dicentra Cucullaria—(Dutchman's Breeches)
Hepatica Triloba—(Liverwort)
Phlox Bifida—(Cleft Phlox)
Sanguinaria Canadensis—(Bloodroot)
Viola Blanda—(Sweet White Violet)
Viola Pubescens—(Downy Yellow Violet)
Viola Pedata—(Bird's-foot-Violet)

**1 each or 8 plants for $1.00**
**5 each or 40 plants for $4.50**
**10 each or 80 plants for $8.00**

## COLLECTION II

*Spring Flowering—Height 16 to 30 inches*

Aquilegia Canadensis—(Wild Columbine)
Arisaema Triphyllum—(Jack-in-Pulpit)
Dodecatheon Meadia—(Shooting Stars)
Geranium Maculatum—(Cranesbill)
Mertensia Virginica—(Blue-Bells)
Phlox Divaricata—(Sweet William)
Polyginatum Biflorum—(Solomon's Seal)
Uvularia Grandiflora—(Bellwort)

**1 each or 8 plants for $1.00**
**5 each or 40 plants for $4.50**
**10 each or 80 plants for $8.00**

## COLLECTION III

*Summer Flowering—Height 18 to 24 inches*

Baptisia Australis—(Blue Indigo)
Eupatorium Coelestinum—(Blue Ageratum)
Liatris Scariosa—(Blazing Star)
Lobelia Cardinalis—(Cardinal Flower)
Lobelia Syphilitica—(Great Blue Lobelia)

**1 each or 5 plants for $1.00**
**5 each or 25 plants for $4.50**
**10 each or 50 plants for $8.00**

## COLLECTION IV

*Spring Flowering—Height 6 to 12 inches*

Trillium Cernuum—(Nodding Trillium)
Trillium Erectum—(Purple Trillium)
Trillium Grandiflorum—(Large White Trillium)
Trillium Recurvatum—(Prairie Trillium)
Trillium Stylosum—(Rose Trillium)
Trillium Undulatum—(Painted Trillium)

**1 each or 6 plants for $1.00**
**5 each or 30 plants for $4.50**
**10 each or 60 plants for $8.00**

## COLLECTION V

*Spring Flowering—Height 10 to 16 inches*

Cypripedium Acaule—(Pink Ladyslipper)
Cypripedium Pubescens—(Yellow Ladyslipper)
Cypripedium Spectabile—(Showy Ladyslipper)

**1 each or 3 plants for $1.00**
**5 each or 15 plants for $4.50**
**10 each or 30 plants for $8.00**

## COLLECTION VI

*Various Heights—12 to 36 inches*

Adiantum Pedatum—(Maidenhair Fern)
Athyrium Felixfemina—(Lady Fern)
Botrychium Virginiana—(Rattlesnake Fern)
Dryopteris Spinulosum—(Toothed Wood Fern)
Osmunda Cinnamonea—(Cinnamon Fern)
Osmunda Claytonia—(Interrupted Fern)
Osmunda Regalis—(Royal Fern)
Polystichum Acrostichoides—(Christmas Fern)
Pteretis Nodulosa—(Ostrich Fern)
Woodwardia Virginiana—(Chain Fern)

**1 each or 10 plants for $2.00**
**5 each or 50 plants for $9.00**
**10 each or 100 plants for $17.50**

**WE PAY THE POSTAGE**

*Order Early—*

*All orders promptly acknowledged*

**FREE CATALOG:**

**Hardy Wildflowers & Ferns**
**Hardy Perennials**

# LOUNSBERRY GARDENS

**OAKFORD, ILLINOIS**


## Bulletins Received

"Control of Water Pollution Should Be a Post-War 'Must.'" Reprint of a speech by Karl E. Mundt, Congressman from South Dakota, in the House of Representatives.

"Water the Orphan". A discussion of the Potomac Dam proposals and the Missouri Valley Authority by the Izaak Walton League of America, 18th Floor, La Salle Hotel, Chicago 2, Illinois.

"Over the Ground". Cornell Rural School Leaflet, Vol. 38, Number 3. The third in a series on getting from place to place. Published by the Department of Rural Education, Cornell University, Ithaca, New York. Free in New York; 25 cents elsewhere.

"Seeing It Through". The story of the contribution of the Bausch and Lomb Optical Company, Rochester, New York, to the winning of the war.

"Year Book 1945". Discussion of humane progress and education in the Chicago area. The Anti-Cruelty Society, 157 West Grand Avenue, Chicago 10, Illinois.

"Education in Conservation of Our Natural Resources." Proceedings of a special education program at the 22nd Annual Meeting of the Izaak Walton League of America. Ten cents a copy from the Izaak Walton League, 18th Floor, La Salle Hotel, Chicago 2, Illinois.

"Proposed Dams on Missouri River Watershed?". Discussion of this program, as it affects wildlife and conservation, by Jay N. Darling, Ira N. Gabrielson and I. T. Bode. The National Wildlife Federation, 1212 16th Street, N.W., Washington 6, D. C. Ten cents.

"Chemicals Indispensable to the American Way of Living". Description of the place of chemicals in living today. Dow Chemical Company, Midland, Michigan.

"Oil for the World". What of the future of oil in the world? Standard Oil Company, Room 1626, 30 Rockefeller Plaza, New York 20, N. Y.

## Vitamin A Declines

Although a considerable percentage of our population must by now be sold on the idea that they can get their energy out of capsules, the Fish and Wildlife Service reports that the nation is producing only a little more than one half the amount of Vitamin A that it did two years ago. The only commercial source of this vitamin are the livers and other viscera of fish, notably the soupfin shark, which has livers out of proportion to the size of the fish, and potent liver oils. Soupfin shark fishery has fallen off sharply, possibly because it has overexploited the resource. Dogfish, found on both coasts, are now being sought, although it takes more of them to produce the Vitamin A units. Halibut are still a good source, but the catch of these fishes is carefully regulated. Cod, once a major source of vitamins, now supply only one percent of the Vitamin A output of U. S.


**IT'S EASY TO LEARN TO WRITE**

The Magazine Institute, a private school owned, operated, and staffed by successful writers and editors, offers an up-to-the-minute course in writing for magazines, which makes it easy for beginners to get started in this rich field. You work in spare time at home. You may concentrate on either fiction or non-fiction. Send today for the FREE CATALOG describing the Magazine Institute method. No obligation.

THE MAGAZINE INSTITUTE, INC., Dept. 4810-C
**50 Rockefeller Plaza, Rockefeller Center, New York 20, N. Y.**

**THOUGHTS HAVE WINGS**

YOU CAN influence others with your thinking! Learn to impress others favorably—*get across your ideas.* Let the Rosicrucians show you how to use the power of mind. For *free book* write Scribe N.Z T.

**The ROSICRUCIANS (AMORC)**
San Jose, California

**VERSE FOR THE NATURE LOVER**

*Engravings and Verse from the hands of one person*

**NATURE AND ART**

by

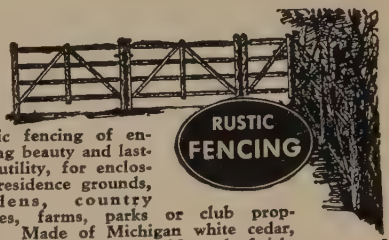
GEORGE J. COX

Only a craftsman could sculpture sonnets and lyrics from words and engravings from wood, and combining the two still preserve their identity and fresh artistic beauty. The poet-artist is Chairman of the Art Department at the University of California. He is sensitive to the nuances of nature in all of its moods.....$ 2.50
Limited de luxe edition.....$10.00

*Order Today From*

**BRUCE HUMPHRIES, Inc. Publishers**

**27 Winchester Street, Boston, Mass.**



RUSTIC FENCING

Rustic fencing of enduring beauty and lasting utility, for enclosing residence grounds, gardens, country homes, farms, parks or club property. Made of Michigan white cedar, with bark removed. Natural finish. Easy to erect. Many attractive designs.

• *Send Stamp for Literature* •

**MICHIGAN ROADSIDE TABLE CO.**
PONTIAC 15, MICHIGAN
Dept. N.

## MEASURING MIDWAY FOR A NEW GREEN GOWN

(Continued from page 414)

salt wind whistles across the islands.

On more than one occasion James' patient workers have planted a whole dune with shrubs and grass only to discover next morning that the wind has swept everything away overnight. Yet he is far from discouraged.

"All Nature needs is a little help, and she will do very well for herself," he comments.

It is not likely his work will be lost. Midway seems destined to be a permanent Naval air station, and when the present wartime equipment and personnel are adjusted to peacetime requirements, there will be more time for conservation. And, too, thousands of Navy men who spent part of their Pacific service here will go home to spread the word about a new and prettier Midway. Even today, when detached, they become suddenly sentimental about the islands, and write almost tearfully of missing the sunsets, the soft Pacific moons, and their friends the birds. Some day they may even want to return—with their families—although it would be dangerous to suggest this now.

Not all of war is destruction, and Midway is waiting eagerly for her new party gown of grass and flowers so she may play the grateful hostess to the nation whose ward she is, and who once saved her from the Japs.

---

## "RACCY," THE MASCOT OF RATTLESNAKE SHACK

(Continued from page 432)

be along about dark to train his hounds for the coming "coon" hunting season; so we coaxed Raccy into our storage room with tidbits and locked her in. We heard the dogs coming in. They investigated the camp site thoroughly, and trailed Raccy to the log house. With the cooperation of their master, the dogs were inveigled into trying a new trail, and soon we heard them in the distance making the going tough for some of Raccy's woodland playmates.

About midnight, when the hunters had gone home, we opened up Raccy's pen. However, she also knew about dogs, and, although we coaxed, she was skeptical and refused to come out. Finally, she succumbed to a tempting piece of candy, grabbed it quickly and hustled back inside again. Finally, we managed to get her out and shut the door, but, of course, we did not dare handle or touch her.

Once out, Raccy sniffed the breeze, standing on her hind legs, her nose in the air. She was really worried. We also knew it was time to remove her from the woods, so the next night the box trap was set on the porch. About 8:30 we heard her arrive; investigating the trap; pulling at the wires and testing things. Soon she went in, the lid banged, and Raccy was again taken away to safety.

Raccy, now about three years of age and a fine specimen of full-grown raccoon, was taken from the zoo for her third trip to Clarks Valley. It was a fine day in early March. There were a few patches of snow on the mountainside, but Rattlesnake Shack stood clear in the circle of surrounding forest land. Raccy fidgeted in her box and as the lid was pried open, was out like a flash. Freedom seemed to delight her; she rubbed against us and between our legs as she walked over the porch. She almost purred; nosed around the old shack, which, no doubt, brought back memories of other pleasant days—or nights—and then went to the spring for a drink of her favorite beverage. Gradually, she set out for the forest, sniffing at familiar old trees and logs. Finally the woods swallowed her up.

At that time—March 3, 1945—we brought a male raccoon to camp. He was furnished by the zoo authorities and we hoped Raccy would thus have companionship and a mate. At any rate, when his cage was opened, he wasted no time and quickly disappeared into the landscape. This raccoon was not tame and indicated it. We wondered whether we would ever see him again, but we knew Raccy would come back when the smoke from our camp stove wafted into the wildwood, or the music from our radio attracted her attention.

A week later Raccy appeared on schedule time, about 10:00 P.M., accepted a treat and left shortly for the bottom lands.

Another week, an emergency trip with Roger Baker, we dropped into camp about 2:00 A.M. We were hardly out of the car when I almost stumbled over Raccy in the dark. She was apparently hanging around the place, either hungry or lonely for attention. We played with her for an hour, during which time she ate enough cake to make her swell out like a balloon.

Then Raccy disappeared! Six weeks passed and no sign of our raccoon. Each week end we watched in vain for her to drop in for her usual visit, but no trace or indication that she had even been near the place. We began to believe that something had happened to her, or that she had gone off into the deep recesses of Stoney Mountain, reverting to the natural wild state of her kind. We missed her.

On Saturday night May 5 we were sitting around the camp table discussing the early spring, and gardening, with friends from the big water dam east of us. It was about 10:30 P.M. The soft glow of kerosene lamps and the flickering firelight from our wood stove made a cheerful setting. Suddenly there was a thumping outside. It sounded like somebody knocking, but it was on the roof. Raccy had returned. Since this, Raccy has appeared regularly according to habit. She looks well, although her fur coat is not in as prime condition as in the colder weather. But she comes for her treats, acts friendly, and then slips away into the darkness, whether to a mate or not we do not know.

---

## Sheep in North America

*Shepherd's Empire.* By Charles Wayland Towne and Edward Norris Wentworth. Norman, Oklahoma. 1945. The University of Oklahoma Press. 364 pages. $3.50.

The impression left with most casual students of the history of North America is that the early Spaniards spent most of their time hunting for storied cities of wealth and killing natives. They did their share of both, but they also brought with them their flocks and herds of domestic cattle, with particular emphasis on sheep. The latter, indeed, were on board the ships of Columbus' little flotilla. From Mexico sheep were taken north into western Texas, New Mexico, Arizona and, later, California. They came as a part of the clerical invasion of these areas, fully as much as they came in the entourage of explorers and military colonists. This, and the spread of sheep and sheep-herding, provide fascinating, exciting, frequently bloody and often romantic pages in our economic history. Mr. Towne and Mr. Wentworth have collaborated to provide not only a unique book but a fascinating one. And the University of Oklahoma Press seems to run true to form in its ability to select notably provocative and stimulating manuscripts for publication.

R. W. W.

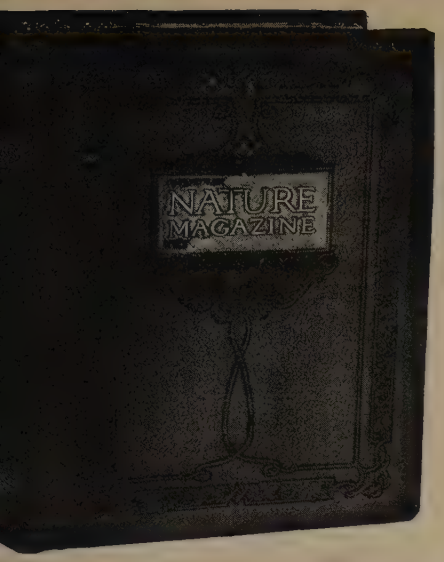
---

## British Conservation

*Our Heritage of Wild Nature.* By A. G. Tansley. New York. 1945. Macmillan. 74 pages. Illustrated. $2.50.

The subtitle of this book is "A Plea for Organized Nature Conservation," and that it is—for it deals with the conservation of rural beauty and wildlife of the British countryside. It might be thought that in the United States, with many pressing and complicated conservation problems of our own, this book would have relatively little significance. In our opinion it has much significance, if only as an example of what has happened and is happening in Britain, and has been or is being repeated here. We may benefit not only from the author's excellent discussion of the reasons for wildlife protection, but from the story of what has been done and suggestions of what should be done.

R. W. W.




## Keep a Year's Issues of NATURE MAGAZINE in this HANDSOME BINDER

**Every number of Nature Magazine is worth reading again and again. For your convenience and pleasure, we have secured this beautiful and substantial binder.**

**Grasp this opportunity for greater enjoyment from your magazines—bind them in our special two-tone, hand-colored cover, embossed in gold, and they will be preserved to give you a lifetime of enjoyment.**

**Many requests make it possible for us to offer you these artistic, leather-like covers, pictured above, especially created for our members, in which you can insert each issue, as you receive it, in a half minute, without any punching or other annoyance to try your patience.**

**Each binder will hold twelve issues and is guaranteed. Your money refunded if you are not more than pleased. $2.25 each**

AMERICAN NATURE ASSOCIATION
1214 Sixteenth St., N. W., Washington 6, D. C.

**Mail This Coupon—Print Plainly**

THE AMERICAN NATURE ASSOCIATION
Washington 6, D. C. Date.....

Send me ..... Distinctive covers for NATURE MAGAZINE, for which I enclose $.....

If I am not unusually pleased I will return them to you within 5 days, and my money will be refunded to me.

Name .....

Street .....

City and State.....


### To the Rescue

We received a hurry call the other day for ten copies of the March, 1945, issue of *Nature Magazine* containing Edwin Way Teale's notable article on DDT. The call came from Mayor Francis P. Freeman of the Borough of Island Beach, Ocean County, New Jersey. He was confronted by a problem such as was envisaged in Mr. Teale's discussion of the insecticide. Test spraying of a five-mile area of Island Beach to eliminate flies and mosquitoes had been undertaken. This area, which is a narrow strip of land between Barnegat Bay and the ocean supporting a considerable stand of virgin timber, is under active consideration as a Seashore National Monument. It is rich in natural history importance, and Mayor Freeman and others were aroused lest it become a biological desert as a result of the DDT experiment.

Following the test it was discovered that the mosquitoes and flies were back on the job within a few days, indicating that periodic sprayings would be necessary to control them. Worse, within 24 hours, thousands of mossbunkers, killies and mullets were washed up on the shore in the sprayed area alone. Four or five dead fish per lineal foot were found, and many crabs in shallow water were dead or dying, also in the sprayed area alone. The U. S. Fish and Wildlife Service agent, who had urged against the spraying, found 150 dead crabs in 200 square feet.

The copies of *Nature Magazine* were rushed to Mayor Freeman, and he saw that they were placed where they would do the most educational good. The sprayings were put off indefinitely. Mayor Freeman deserves well of his constituents.

---

### IMPOSING ON MOTHER

By MAUD JAMISON SELBY

A group of Brewer blackbird fledglings were receiving the final course on "How to Eat." Fully as large as their parents, they were all able to pick an insect from the ground, and all except one could get it swallowed. This backward youngster still trailed its mother, begging vigorously. Now and then the young one would provide a morsel for the parent, intending to have it given back, but the mother would calmly swallow it and hop away. She seemed tired of this extended babyhood, only providing an item of food now and then. Finally the offspring picked up a short, dirty piece of string, offering it to the mother bird. That was the last straw. She seemed to tremble with indignation. If she had had hands she would, it appeared, have slapped the youngster. She did give him a tongue-lashing in bird language that left him wilted and disgraced. It should have taught him to leave her apronstrings for good, and I suspect it did.


## Know Your Stars

**Broaden your scope of understanding beyond our little world; reach out for information about the universe; it's interesting and not so very complicated.**

**The earth rushes through the solar system at an amazing speed. Every night we have new neighbors, some familiar friends; others, with a distant mysterious look, challenging identity.**

**Own a star finder and you are behind the scene of this year's heavenly displays. Have at your finger tips a mirror of the sky for every hour of darkness.**

## Handy Star Finder

(Size 8½ x 8½ inches)

**An excellent and accurate device for amateur astronomers. Equipped with a sliding screen adjustable to any northern latitude. It gives the right ascension of the principal planets for the years 1941 to 1945; names of constellations with their principal stars; astronomical terms; distances of the planets from the sun.**

***A Real Value at Only 50c Each***

(Quantity discounts to schools for classroom use)

NATURE MAGAZINE
1214 Sixteenth St., N.W.
Washington 6, D. C.

Enclosed is ..... for which mail me postpaid ..... HANDY STAR FINDERS.

Name .....

Street Address .....

City and State .....

## BLACKWATER

(Continued from page 428)

near the section. The *Distichlis* bears its seeds in clusters, and is not digitate; it appears erect when growing. *Spartina patens,* on the other hand, has narrow leaves, is more or less digitate, and always appears to have been recently rolled on by a herd of elephants. It is always recumbent, and is hence sometimes called bent grass.

Proceeding shoreward, or landward, rather, since there is no true shore here, one comes into the areas of *Panicum,* or switch grass, as one approaches drier land. This is a tall, feathery grass growing on higher ground. Often associated with it is the marsh mallow, *Hibiscus moschrestos,* with its dozens of three-foot stalks bearing great rose and white flowers, resembling individually the florets of a hollyhock, although different from that plant in its manner of growth.

Where there is *Panicum,* you may walk, more or less safely, as far as dry feet are concerned. Where there is marsh hay, beware. Where there is three-square, you may possibly leap from tussock to tussock, but hip-boots will be your safest footwear.

After the *Panicum,* still moving landward, comes wax-myrtle and bayberries, both shrubs that mingle with and are found between the *Panicum* on the water side and the dark green of the loblolly pines on the land side. This pine is the chief one to be found in this area, there being almost a pure stand of it on many of the islands, and on the parts of the mainland bordering the marshes. It extends farther into the marsh than does any other tree, although, of course, it does not grow out upon the marsh proper, but is confined to higher areas, where there is no standing water.

In this zone, the *Pinus taeda,* or loblolly, is the outstanding form of plant life. It can be readily determined by its long needles, arranged in groups of threes, and by its straight trunk and bushy head, which often assumes a rounded contour, or occasionally a rounded contour with a flat level top. When it grows in difficult places, so that the roots are cramped, or harmed by standing water, it sometimes assumes a bizarre, twisted form, like the trees found on mountains near tree line, stunted but determined to live.

Here, among the pines, is a richer flora than in any other part of the area. Many shrubs, vines, and small trees appear about the trunks of the taller trees. In the sunnier spots is the wild swamp rose, *Rosa carolina,* a glory of bloom in June, and a riot of color in the fall, when its prolific red seedpods glow against the landscape's tawny grasses, dark pines, and brilliant blue sky.

The dwarf sumac, *Rhus copallina,* is bright with berries, like the rose, in fall and winter, and is a member of this pine association. Among the other trees, although in the minority always, are the black oak, black locust, holly, sassafras, persimmon (beloved by the opossum), alders, cherry, sweet gum and red cedar. Additional shrubs and vines include blackberries, cat brier, bull brier, and the trumpet vine.

Besides these zones of plant life, there are isolated colonies of needle grass, *Juncus roemerianus,* a true rush, which grows in large plats, propagated by its running rootstocks. This prefers brackish marshes, where there is little change in the water from day to day. Cattails, too, both the broad and narrow-leaved varieties, grow in islands of vegetation, within the zones of other types of plant life and in colonies like the needle grass.

The animal life of the Blackwater is as varied as its vegetation, and varies with it. Great flocks of wildfowl find refuge here, and are at home in the water, and in the marshes adjacent to the water. The rivers, the ponds, and the canals are often bright with the colorful plumage of the mallards, gray with flocks of Canada geese, or dotted black and white with an occasional black duck or snow goose. Yellowlegs and other shore birds wade in the shallows among the three-square sedges, and sit unconcernedly, as do the ducks, on the slight hillocks of the muskrat houses, often the only vantage points available in the wide stretches of the Blackwater.

Wherever there is three-square sedge, one is likely to find muskrats, or, at least, their houses, trails and sign, since the animals themselves are wary and elusive. Sometimes the houses are widely scattered, but in other sections one might almost step from house to house for as far as the eye could reach. In such spots the marsh will be almost denuded by the animals, with numerous small canals, trails and runways crisscrossing it in a veritable network.

The islands, the higher lands, have as different a fauna as they have a flora. Foxes, raccoons, opossums, an occasional weasel, squirrels, rabbits and chipmunks are all found in such places. The carnivores make the islands their headquarters and sally forth upon the neighboring marshes by night, keeping fat and sleek on Musquash, the muskrat, as his Indian friends used to call him.

An occasional coon will adopt a muskrat house as his own, and live entirely on the marshes, subsisting completely on muskrats. Such an animal is known as a marsh coon, and will most likely end his life as a fur collar. Muskrats are the money crop of the marshlands, and the enemy of the muskrat is automatically the enemy of the trapper, especially if the creature's skin is also worth money in the fur market.

The marshes are fairly quiet by day, except for the abundant bird life, but by night they are very much alive. Night comes slowly over the marshes, for there are few trees and no hills to hide the setting sun, and the water holds and reflects the light as long as the sun is even a few degrees above the horizon. Long fingers of light reach out between the dark islands, making each muskrat house stand out, a dark, rounded outline against the watery wastes. The ducks and geese, the teetering yellowlegs, have gone to rest, as have the noisy crowds of red-winged blackbirds among the cattails, and the scattered coveys of quail on the pine islands.

Then the marsh wakens in reality. This is muskrat time. The small, whining noises of the female, and the deeper notes of the male, are heard in the canals and leads all through the marshes. Muskrats seem to mate every month of the year except in December, although more frequently from the end of February until the middle of April. Thus there is not only seasonal activity associated with most animals, but a continuous busyness that makes a thickly-populated muskrat community a teeming center as night comes on. Many rats live in one house, but all are usually members of the same family. The muskrat is a community-minded animal, and an interesting and valuable animal, as well.

This, then, is the Blackwater—a transitional marsh, poor in many things usually considered adjuncts of a rich land, but rich beyond measure in wildfowl, in native beauty, in animal life, and in value to us as a reservoir for these too rapidly vanishing parts of the American scene.

---

## "An Epic Poem"

*Whisperings from Ancient Oregana.* By Clifton L. Inman. Boston. 1944. Chapman and Grimes, Inc. 174 pages. $2.00.

Clifton L. Inman has constructed a long poem entitled *Whisperings from Ancient Oregana* out of incidents supposed to have happened in the long-ago past of what is now our Northwest—"an epic poem of passions, of love and hate, of the impestuousness and violence of two great chiefs, Wapota the Hoopah and Nomon the Klamath. It is the story," continues the publisher's summary, "of the wrath of the god Oonah, and his destruction of those who dared to defy or ignore his warnings." The conception of the poem is worthy, the execution is without pretense, yet its reality seems to remain for the reader's own construction. There is an admirable ease in versifying, with a pleasing variation in meter and in the rhymes employed. There are occasional stanzas of pleasing descriptions. The book has an inscription in which modesty and cleverness are close rivals:

If in search of perfection, pray open me not
For I offer no food to your need.
I am just a reflection of common-run thought
For the common-run people to read.

## WHEEL CHAIR NATURALIST

(Continued from page 435)

self by copying, but Dr. B. W. Wells, Head of the Botany Department of State College, himself an amateur artist, (he had sent her the brushes and paint) later met her and gave her some constructive criticism and suggestions. He is anxious for her to sketch and paint directly from Nature.

For the present, at least, Evelyn has passed the peak of her writing interest, and her burning enthusiasm is botany, particularly taxonomy—and the painting of wild flowers. During this past summer of 1945, she studied at Duke University under a grant from the North Carolina Division of Vocational Rehabilitation. There she did special work in the Herbarium, under Dr. Blomquist.

Of course, to do all this, Evelyn has been fortunate in both her family and her friends, especially Hattie. Everything that has been possible to do in a simple farm home has been done for her. A reader of my column (which has featured Evelyn) writes me: "It *is* wonderful, what Evelyn has done, and what Hattie has done to help her, but I want to see tribute paid, too, to her wonderful, brave, patient, devoted, and hard-working mother."

As for Hattie Turner, Evelyn says: "I realize how much I am indebted to Hattie. Without her there would have been no 'Treasure Islands,' nor would I have been able to make the wild plant survey of over five hundred species of my neighborhood."

In recent months the girls have been together less often. You can guess the answer. The war, and gas. Hattie now lives more than ten miles away; too, she has a heavy teaching schedule and her school teacherage is more than six miles away, with no bus, nor any other, connections. There just has not been enough gas to get together often.

As for Evelyn, I think of her often when people, with full use of all the body, write, or tell me, rather wistfully: "How I wish I knew the birds"—or it may be the flowers, or ferns or stars—"but I never went to college." Or: 'I never had any botany, or bird study, but, oh, [and this is always *very plaintive*] if I could just have someone around always to tell me about them!"

Yes, Evelyn is remarkable. But there is yet another thing to tell about her. She is naturally right-handed, but in time, as the right hand became the more crippled of the two, she deliberately set about learning to use her left hand. In doing this she had to begin all over, learn first how to make letters, next to combine them in words, then to use a pen, and finally to sketch and paint.

More than anyone I know, Evelyn has learned well in Nature's "temple fair and free."

## OUR ANCIENT EARTH

(Continued from page 437)

the month it will be as brilliant as Vega. Mars will be in conjunction with Saturn on October 26, and with the moon on the same day but some hours later. There will be a brief grazing occultation of Mars by the moon, lasting only a few minutes, about 11:03 P.M., Eastern Standard Time, on October 26 in New England.

Saturn is in Gemini this month, and will be in quadrature with the sun on October 18, when it will be on the meridian at sunrise. At its conjunction with Mars on October 26 it will be about one and a half degrees south of the ruddy planet, and exactly equal to it in brightness. In color it is a pale yellow.

---

### October Authors

Edwin D. Neff is a former Washington, D. C., newspaperman now roaming the Pacific as a Lieutenant in the United States Navy. He took his nose for news along with him, with the result that his current contribution is one of several he has made to our pages. In this instance Erle Rodriguez, chief photographer's mate, collaborated with him in the matter of illustrations.

E. E. Stanford is professor of botany at the College of the Pacific, Stockton, California, author of several books and many articles, and a specialist on economic botany.

Allan and Ellen Bonwill compose a new team of Nature writers who like to explore the mysterious. Mr. Bonwill is high school principal of the Damascus, Pennsylvania, Township School District.

A. B. Champlain makes his appearance in our pages after a lapse of several years. He is Principal Entomologist of the Pennsylvania Department of Agriculture and the proprietor of Rattlesnake Shack.

W. J. Schoonmaker, who makes his first but not his last appearance in our pages, is Assistant State Zoologist of the New York State Museum at Albany.

H. R. Ivor maintains a bird sanctuary and bird-study aviary near Cooksville, Ontario, Canada, and has written several articles for us on his studies.

Charlotte Hilton Green is a Raleigh, North Carolina, newspaperwoman and naturalist. She is the author of several Nature books and many articles.

John Lindsey Blackford, Libby, Montana, Nature writer, needs no introduction to our readers.

Alexander F. Skutch, noted naturalist now living in Costa Rica, does a double-header in this issue with two short articles from his adopted country.

Howard Zahniser is leaving government service to become secretary of the Wilderness Society, a post left vacant by the passing of Robert Sterling Yard.


# CLASSIFIED

## CURIOS

HOBBY catalogue, 10c. Chameleon, 25c. Twenty different Mexican miniature glass animals, $2. Wholesale list for dealers. **QUIVIRA SPECIALTIES, Topeka, Kansas.**

## MAGAZINE

AMATEUR Scientists' Magazine has news, articles by science enthusiasts in all fields. Copy, 15c. Twelve issues, $1.00. **ASMAG, Box 73N, Memphis 1, Tenn.**

## Medical Technicians

**Medical Laboratory Technicians** in great demand. We train you in your own home, in your spare time. Bulletin free. **Imperial Technical Institute, Box 973-C, Austin 5, Texas.**

## MINERALS

"ROMANCES in stones." Arizona rare minerals. Collectors or museum grade, 12 miniatures, assorted, colorful, brilliant, genuinely rare, $3. **Sam Parker, 2160 East Van Buren, Phoenix, Arizona.**

## NOVELTY PLANTS

**CACTUS ROCK GARDENS.** Crystal rock and soil 2 for $1.00. 10 larger Cacti with booklet $1.00. Double Petunias $2.00 per dozen. **COOVER'S, Orlando, Florida.**

## PIGEONS

**THE PIGEON LOFT, Sherman Oaks, California.** Illustrated monthly. Helpful articles on the joys of breeding fancy, racing, utility pigeons. $1.50 year. Sample 10c. Satisfaction assured.

## Photo Developing

CENTURY delivers work and service that can't be beat. 8-exp. roll, 25c, with two professional enlargements FREE. **CENTURY PHOTO SERVICE, LaCrosse, Wis.**

## SEA SHELLS

**SHELLS FOR SALE** Land and Marine; Cape Cod Special 12 for $1.00 in box; Lists on request. **MRS. F. K. HADLEY, Box 33, West Newton, Mass.**

## TAXIDERMY

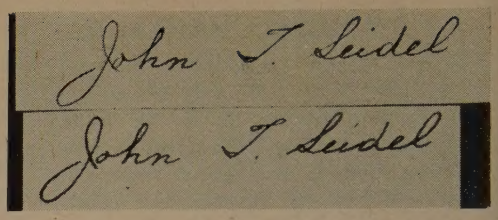
LESSONS, mount animals, 20 pages illustrated, 98¢. Uncalled trophies, glass eyes, supplies. **Taxidermist News Magazine, 981-A Gates, Brooklyn 21, N. Y.**

## WRITING

**SELL IN THREE MONTHS OR MONEY BACK**
If you can write correct English—You can write Juveniles. I have sold some 3000-3500 stories . . . articles . . . editorials . . . serials . . . series. Now I'm teaching.
"Instruction—Criticism—Collaboration"
Write Dept. N for terms
**WILL HERMAN**
Author of "My Juvenile Success Secrets" and "My Formula for Fiction."
**Sanford, Fla.**

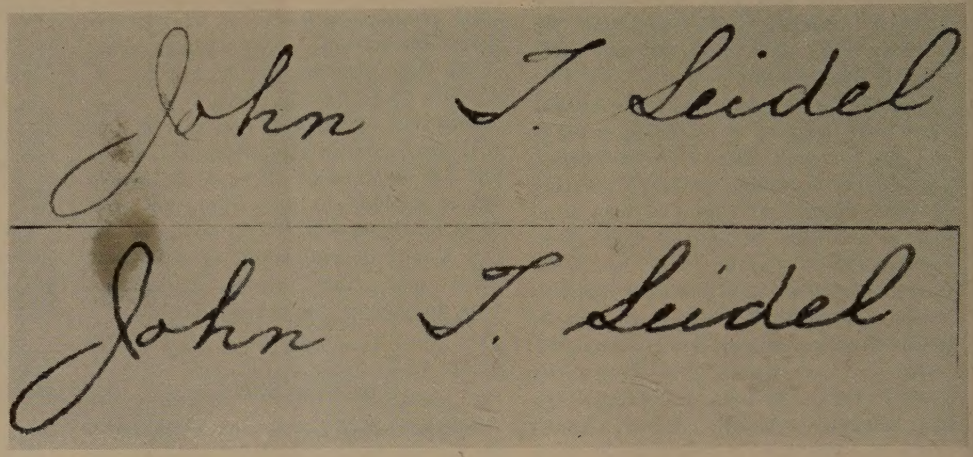
**THE TEN-YEAR INDEX**
**(Volumes One to Twenty)**
**makes Nature Magazine a textbook. Order yours now . . . 50c**

# Under the Microscope




By JULIAN D. CORRINGTON

Above, original signature and tracing under it. Below, the same magnified, original above, tracing below.




## TELLTALE TREMORS

*"The document in question—a letter, to be frank. . . ."*
POE: *The Purloined Letter.*

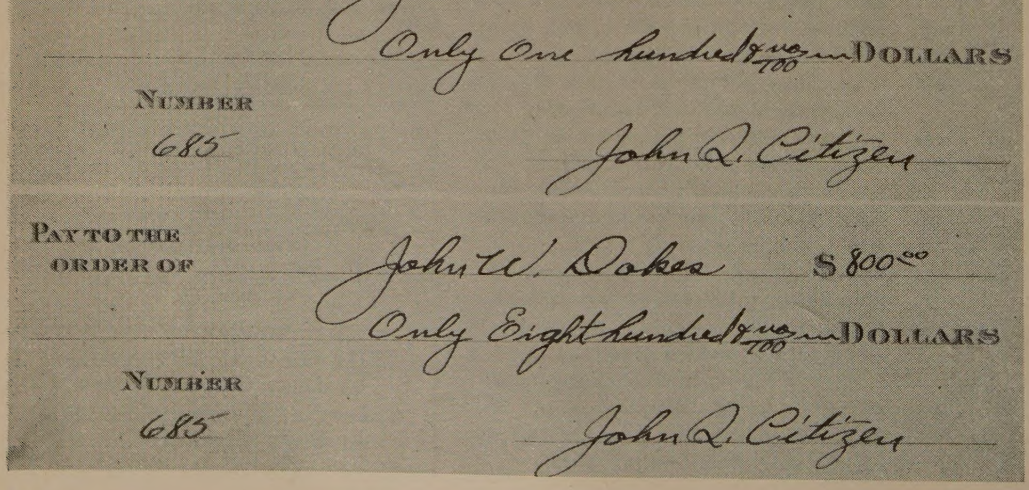
In the modern field of scientific crime detection—usually incorrectly termed "criminology"—one of the major departments is that of Questioned Documents. Our article on "Typewriter Personalities" introduced this subject in the January, 1944, issue, and gave illustrations as to methods of detection in connection with typewritten material. This month we shall inspect some examples of handwriting.

There are many scientific aids that have revolutionized tracking down the authorship of such documents as ransom notes or poison-pen letters, and of detecting forgeries, counterfeits, and raised checks. The police laboratory now uses ultra violet, infra red, and X-ray illumination, the colorimeter and the spectroscope in analyzing and comparing papers and inks in revealing hidden messages, alterations, erasures, or overwriting. One of the first steps, however, is an inspection of the characteristics of the handwriting itself, best done with a low power binocular microscope.

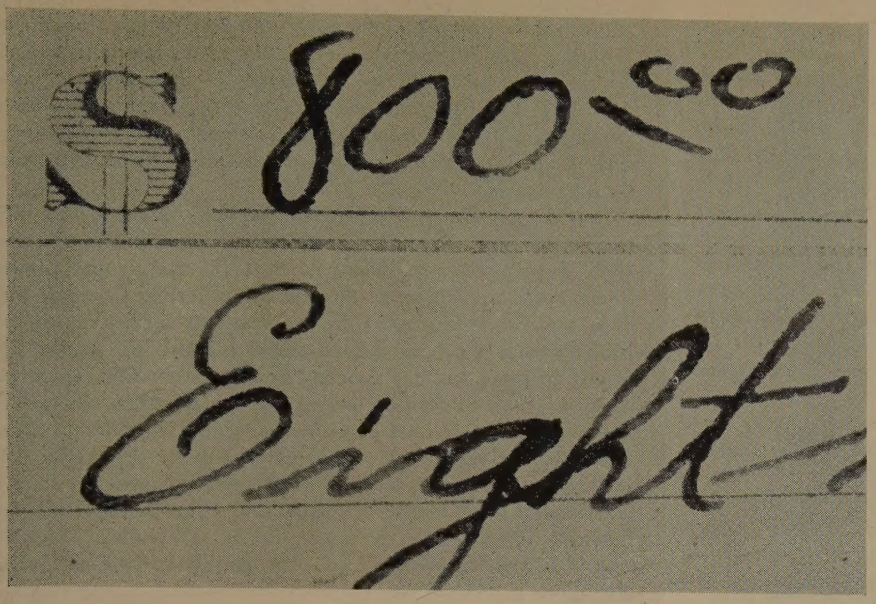
The amateur may experiment with some of the basic principles in this field by using a 10X hand lens, the lowest power of his compound microscope, or by making macrographs. In this connection recall that removing the front half of the low power objective on most standard makes will give a much lower power, focusing at a higher level, with a great deal of working distance.

One of our illustrations shows a genuine signature, "John T. Seidel" (upper) and, below, a tracing of this name made by another person. This tracing was made after some practicing, and is a very good imitation of the original. When magnified, however, there are certain points to look for that will reveal the spurious signature, seen in the lower of the two enlargements. The lines throughout show a greater pen pressure, caused by the slowness of careful tracing, there are overlaps due to reversed direction of travel, and numerous instances of tremor, also induced by the slow speed. The J alone, of the word John, shows all three of these defects.

Of the two illustrations of a bank check made out to "John W. Dokes," that for one hundred dollars is the original, while the other shows the same check after being raised to read eight hundred dollars. Unmagnified, the work has been sufficiently well done as to escape ordinary detection; when enlarged, though, the alterations become conspicuous to the trained eye. An S-shaped curve has been added to the numeral 1 to convert it to an 8; the point of union of the new with the old pen strokes is cleverly executed, but shows nonetheless. In the written amount, "one" is raised to "eight" as follows: a loop is added above the o to make a form of the letter e used by many people; a dot for an i is placed above the first upstroke of n; a g is made by joining the second upstroke of n to the e, plus a downstroke loop, then the ht is added at the end. This last can only be done where the incautious check




Upper, original check for $100; lower, same check after raising to $800.




**Magnified detail of raised check.**

writer has left enough space. All checks cannot be raised, but the number that can be is surprisingly large, and the check-raiser's bag is full of many and varied tricks. The foregoing example is only one of hundreds that could be used.

Paper currency depends for its integrity on many carefully guarded secrets having to do with the paper, its watermarks, disposition and character of the minute colored threads, the ink used, intricacy of the printed design, and the location and nature of certain keynote details. A counterfeit is usually told with ease when these features are examined with a hand lens or binocular microscope, but many other tests are available for cases involving very expert imitations.

You can fool all the people some of the time, and so on, and so on, but you cannot fool the microscope any of the time!

## APPLE POLISHER

The best sort of project for the science club is one that relates something learned in the classroom to everyday experience or to the world outside the school. The project should have a serious purpose or promise a worthwhile addition to the student's storehouse of information, yet should be practical and interesting; it must never be just another lesson or smack of the assigned textbook or laboratory notebook. If the pill can be sugar-coated by designing the approach as a game, contest, or series of experiments, without getting out of hand and descending to the merely trivial, then the period will work up genuine enthusiasm and be well received.

In connection with this month's feature article, the subject of scientific crime detection is one that interests nearly all people. No matter how serious the article or profundly technical the discourse, it is impossible in this field to get entirely away from the spectacular or even the sensational. A case involving the tracking down of clues by any means smacks of the detective story and imposes problems of solving puzzles, of reasoning from cause to effect, or of matching wits with the other fellow. When the means employed bring in the latest discoveries of science, there is the added feeling of being thoroughly up-to-date and of using impersonal and implacable methods that are certain to triumph in the end. Who can resist the lure of such a proposition?

In most extracurricular organizations associated with science departments there will be one or more students who have been fascinated by this subject and can lead a project; if not, the sponsor will have little difficulty in arranging one or more sessions devoted to scientific crime detection. The teacher may write to the Federal Bureau of Investigation, United States Department of Justice, Washington, and request a copy of *Scientific Methods of Crime Detection in the Judicial Process,* by John Edgar Hoover, an excellent summary of methods, with abundant citations of legal cases and the literature.

The larger libraries will contain texts, manuals, and references. Cooperation of the city police department or the sheriff's office may be enlisted, and a speaker from one of these sources or the FBI secured. Speakers and discussion groups have their place. However, the real merit of any project of this character depends on giving the individual members something to do with their hands as well as their brains, and in our next issue we shall begin a series of suggested performances that will bring in contributions from the physics, chemistry, and biology laboratories of the school or college, and thus enroll all science students, regardless of their special interests.


# Background for the Microscope

**Equipment for the pursuit of microscopy may be as simple or as elaborate as individual inclinations dictate; but there is one item wholly indispensable —*books!* The microscope is handmaiden to all the sciences, and those who follow its adventuresome trail must have many a guide to direct along the right path.**

**Here is NATURE MAGAZINE'S selection of best bets. Check your library and add those that fail to answer the roll call. Buy one each month, or as often as you can. Suggest them as gifts. Buy them for the relative or friend whose chief joy is working with his microscope. Entries will be changed periodically; here is a basic list for a starter:—**

### MICROSCOPE

**The Microscope,** by S. H. Gage; 17th ed., most celebrated American work; very thorough.....$4.00

**The Microscope,** by R. M. Allen; Excellent new manual.....$3.00

### MICROTECHNIQUE

**Working with the Microscope,** by J. D. Corrington; New guide for self help or classroom with graded series of lessons, from single to advanced. $3.50

**Adventures with the Microscope,** by J. D. Corrington; An informative and interesting text for the younger hobbyist or biological student..$5.00

**Animal Micrology,** by M. F. Guyer; Best general guide for histology and zoology at the college level....$2.50

**The Microtomist's Vade-Mecum,** by A. B. Lee; Encyclopaedic reference, standard, advanced; botany and zoology.....$9.00

### PHOTOMICROGRAPHY

**Photomicrography,** by R. M. Allen; Splendid new work by recognized authority; complete; fully illustrated.....$5.50

### BOTANY

**Textbook of Botany,** by Transeau-Sampson-Tiffany. Beautifully designed, readable, recent.....$4.00

### ZOOLOGY

**College Zoology,** by R. W. Hegner, Fifth Edition; most successful work of its kind; gives all main animal types and their structure.....$3.75

**Animals Without Backbones,** by R. Buchsbaum. Fascinatingly written and illustrated; new style invertebrate zoology.....$5.00

**Man and the Vertebrates,** by A. S. Romer. Companion volume to preceding; excellent general survey. $4.75

ORDER FROM

MICROBOOK DEPARTMENT
NATURE MAGAZINE
1214 Sixteenth St., N.W.
Washington 6, D. C.

## TRADE NOTES

***Parasitology*** One of the most successful general texts in the field of animal parasitology is now in its seventh edition, a statement that alone says much for the worth of a book. The *Introduction to Parasitology, with Special Reference to the Parasites of Man,* by Asa C. Chandler, is widely and deservedly well known; the seventh edition is a complete rewriting and within only the last four years, progress in this science being so rapid. Airplane dissemination of arthropods and of diseases they may carry, use of penicillin in treatment of syphilis, and use of DDT as an insecticide can be mentioned as samples of innumerable changes and discoveries resulting from war-accelerated research that are to be found within these pages.

The chief aim in this work is to present an introductory survey of the whole field. Emphasis is away from the taxonomic and morphologic and upon host-parasite relations, life cycles, underlying principles of prevention and treatment, and epidemiological factors. The three Parts deal with the orthodox divisions of the subject—Protozoa, Helminthology, and Arthropods, but these are integrated to provide general biological facts and principles. The spirochetes, Rickettsias, and filterable viruses have been retained from earlier editions, even though the pathogens concerned are now recognized as non-animal in nature.

This book is admirable for use as a text in college courses, but the author has also kept in mind the needs of the general reader who wishes information on the medical and zoological aspects of parasitology, a science that has mushroomed in importance in an era of global warfare and travel. Adequate references to the literature occur at the end of each chapter, and a periodical list as an appendix. Pp. x, 716; figs. 309. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, 1944. $5.00.

***Astronomy*** A new member of the family of Harvard Books on Astronomy has been added, *Telescopes and Accessories,* by George Z. Dimitroff and James G. Baker, of the Harvard College Observatory. The amount of information in this smallish volume is enormous, beginning with a chapter on light as a tool, progressing through an analysis of the many kinds of visual telescopes, then the photographic process and photographic telescopes, to spectroscopy and measuring light, climaxing in instruments for solar research and the building of a telescope. The appendix considers invisible (coated) lenses, radial velocities, tables of the largest reflectors and refractors, of the various types of cameras, and 36 photographs of diffraction images of a star.

This book will fill a need of astronomers, young and old, amateur and professional, while the general reader can glean much of great interest in the history and methods of man's struggle to gain a knowledge of the universe of which he is a part. The illustrations form an important portion of this information and range from simple line drawings of optical systems to views made through various instruments and photographs of telescopes of every sort, from the smallest designs to cutaway diagrams of the great unfinished 200-inch reflector of the Mt. Palomar, California, Observatory. Pp. v. 309; figs., frontis., 164, 36. The Blakiston Co., 1012 Walnut St., Philadelphia 5, 1945. $2.50.

***Mycology*** *A Manual of the Aspergilli,* by Charles Thom and Kenneth B. Raper, of the Northern Regional Research Laboratory, Bureau of Agricultural and Industrial Chemistry, United States Department of Agriculture, at Peoria, Illinois, is a fine example of the results of exhaustive and scholarly research on a single group. Designed as a manual to aid workers, and not as a monograph, this book has a twofold purpose: to provide the worker who encounters an aspergillus with a means for its identification, and to enumerate all forms found in the literature and indicate their proper allocation.

The illustrations are magnificent, including seven plates of six figures each in full natural color, by Roland W. Haines, photographer for the Laboratory. The text is based on a comparative study of thousands of strains of aspergilli in culture, and is a recognition of the importance of these fungi in decay processes, as pathogens, and as fermenting agents capable of producing antibiotic substances and valuable biochemical products. Penicillin or closely similar substances are manufactured by many species.

Part I, the general discussion, includes history, classification, synonomy, morphology, cultivation, examination, preservation of cultures, and variation. Part II, the manual proper, begins with a chapter on methods of using the manual, then considers fourteen species groups. Part III includes a topical bibliography, a general bibliography, a check list, and a listing of accepted species, varieties, and mutations. In the second Part, a group exposition begins with outstanding characters, a group key or general considerations and laboratory cultivation, the included species, group synonyms, occurrence and economic importance, and antibiosis or pathogenicity. This is an essential book for the specialist and a fine reference for all botanists interested in the fungi. Pp. ix, 373; plts. 7, figs. 76. The Williams & Wilkins Co., Mt. Royal & Guilford Aves., Baltimore 2, 1945. $7.00.

***Botany*** A botany written for the layman and amateur gardener rather than for the classroom is the interesting new *Plant Growth,* by Dr. L. Edwin Yocum. Written "in an attempt to bring together the knowledge necessary to answer (as far as possible) the many technical questions which the plant lover may ask about growing plants—the 'how and why' of plant growth," this compact volume explains most of the anatomy and physiology of the plant as would a conventional text, but relates such information to the practical affair of raising plants in the garden.

There are chapters on seeds, germination, seedlings, cell structure, roots, absorption of water and minerals, the soil, stems and buds, pruning and training plants, propagation, leaves, food making, transpiration, insects, diseases, weeds, flowers, heredity and hybridizing, hormones, soil improvement, fertilizers and hydroponics and rest periods of plants. The book is soundly scientific and modern, keeps technicalities to a minimum yet builds up a professional vocabulary, and always relates each topic to the business of running a successful plot of plants. It will be a most useful addition to the library of all who raise plants—farmer, gardener, horticulturist—professional or amateur. Pp. 203; plts. XVI, figs. 25, glossary, index. The Jaques Cattell Press, Lancaster, Pa., 1945. $3.00.

J. E. Nielsen, President of the State Microscopical Society of Illinois and a member of the A.S.A.M., has issued No. 8 of his Diatom Notes, dated November, 1944, and entitled "Introduction to Arachnoidiscus." The characteristics of this well-known genus are given, together with illustrations and a discussion of the nature and functions of the poroids, as resolved by the electron microscope. Geographic distribution is outlined and there is a key for identification of the five species most commonly encountered. The paper concludes with an interesting note on the construction of the Arachnoidiscus valve from the engineering standpoint. The problem is that of supporting a loaded disc along its circumference. Many engineers favor strong radial ribs and lighter cross ribs and use this design as being most efficient for cast iron manhole covers, just as Nature has done for the Arachnoidiscus valve.

## MICROQUIZ PHOTO

That interesting photomicrograph in our preceding issue that seemed to depict tenpins, or markers in some sort of game, or closely spaced ranks of tombstones, was nothing more unusual or exciting than a piece of butterfly wing, showing mostly white and some black wing scales, with a few wing hairs extending across the field, at 73X. What you see is all in the point of view anyway, isn't it so? This was a bug's eye view.